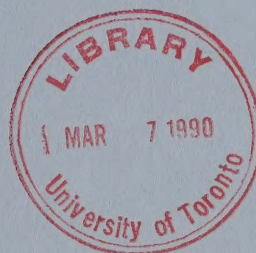




National Energy Board

Reasons for Decision

Proposed Amendment
to Export Impact
Assessment Filing
Requirements



November 1989 .

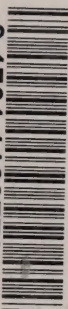
Export Impact Assessment

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National Energy Board

Reasons for Decision

Letter dated 7 September 1989 on the Proposed Amendment to Export Impact Assessment Filing Requirements

November 1989

Export Impact Assessment

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On 7 September 1989, the Board issued a letter to all interested parties inviting their views on proposed amendments to the Export Impact Assessment (EIA) filing requirements.

The filing of an Export Impact Assessment is one component of the Market Based Procedure (MBP) established by the Board in July 1987. In its Reasons for Decision¹ the Board stated that:

applicants for licences to export natural gas will be required to submit an assessment of the impact of their export proposal on Canadian energy and natural gas markets. This impact assessment will be considered at the public hearing convened to examine the application. The purpose of the impact assessment will be to allow the Board to determine whether a proposed export is likely to cause Canadians difficulty in meeting their energy requirements at fair market prices.

The Board did not prescribe a specific methodology for conducting this assessment but outlined the matters to be analyzed in such a study relating to gas supply, energy demand and natural gas prices.

Since 1987, two issues have arisen regarding implementation of the EIA:

- 1) it is difficult to measure the impacts of small export projects, and

- 2) there appears to be some uncertainty on the part of applicants as to how the EIA requirements may best be satisfied.

To promote discussion of possible means to improve the utility of the EIA, the Board appended to its letter of 7 September an illustrative example of how an EIA might be conducted. The paper addressed the price, demand and supply reactions to a large, hypothetical increase of exports. The paper was not presented as a Board conclusion about the acceptability of any particular level of exports but as a technical illustration of one possible approach to the conduct of an EIA.

A draft proposal for amended filing requirements was also attached to the invitation for comments. The intention of the proposal was to limit the requirement for the preparation of an EIA to those situations in which the assessment was likely to provide useful assistance to the Board in satisfying itself that the proposed exports would meet the criteria of Section 118 of the NEB Act.

A summary of the comments received, the views of the Board and the Board's disposition in this matter are included in this report.

1 National Energy Board Reasons For Decision in the Matter of Review of Natural Gas Surplus Determination Procedures July 1987

For the most part, the submissions filed did not support the draft proposal for amended EIA filing requirements as contained in Appendix B to the Board's letter of 7 September 1989. The views expressed ranged from eliminating the EIA filing requirement in its entirety because it is redundant in a competitive natural gas market, to enhancing the role of the EIA in order to ensure that Canadian gas requirements will be met. Most submitters agreed that the measurement and quantification of the impacts of small export projects were difficult.

The Alberta Petroleum Marketing Commission ("APMC"), Canadian Petroleum Association ("CPA"), Independent Petroleum Association of Canada ("IPAC"), C.G. Edge and Associates Inc., Amoco Canada Petroleum Company Ltd ("Amoco"), Canadian Hunter Exploration Ltd. ("Canadian Hunter"), JMC Selkirk Inc. ("Selkirk"), Pan-Alberta Gas Ltd. ("Pan-Alberta"), ProGas Limited ("ProGas"), Westcoast Energy Inc. ("Westcoast Energy") and Western Gas Marketing Limited ("WGML") argued that the EIA should be eliminated from the Board's Market Based Procedure. Their submissions reflected the view that the EIA was redundant because the information required by the Board to assess an export proposal would be captured in the complaints procedure or in the benefit-cost analysis. In particular, many of these submitters argued that any concerns about the protection of Canadian consumers could be dealt with through the complaints procedure. Many argued that competition in the market place would balance supply and demand through price changes and as a result adjustments would occur through the operation of the market mechanism. Therefore, the onus should be on domestic consumers to demonstrate adverse impacts. Selkirk suggested that the EIA could be incorporated into the complaints procedure to permit parties to demonstrate any adverse impacts of an export proposal. Moreover, this group of submitters generally held the view that the Board's biennial *Canadian Energy Supply and*

Demand projections and annual *Natural Gas Market Assessment* provided sufficient avenues for the Board to assess the Canadian gas requirements and market structure. The proposed 200 PJ per year exemption level was viewed as an arbitrary threshold.

The submissions of the Consumers Association of Canada (Ontario) ("CAC"), The Consumers' Gas Company Ltd. ("Consumers"), Gaz Métropolitain ("GMI"), ICG Utilities (Ontario) Ltd. ("ICG (Ontario)") and Union Gas ("Union") also reflected the view that the proposed 200 PJ threshold level was arbitrary and that it would provide an opportunity for potential applicants to rearrange their affairs to avoid the requirement to file an EIA. This group and the Ontario Ministry of Energy opined that the EIA is an essential aspect of the Board's Market Based Procedure to determine the ability of Canadians to meet their energy requirements at fair market prices and that therefore its role should be enhanced.

There was general acceptance by both the producing and consuming interests of the Board's role in monitoring export projects. Comments varied on the options proposed in Appendix B to have the Board conduct a preliminary EIA to be issued with a hearing order and used by parties as they saw fit (option 2(a)) or allowing parties to prepare a joint EIA (option 2(b)). Most comments focussed on the first alternative with qualifications or stated concerns.

Ontario Ministry of Energy ("Ontario"), ICG (Ontario), GMI, Union, and ProGas supported an assessment done by the Board. ProGas believed a Board EIA should be background information similar to the *Canadian Energy Supply and Demand* reports and the *Natural Gas Market Assessment*. Ontario and Union also favoured the assessment being done with periodic or annual updates. Consultation with the industry was a primary concern in the preparation of a Board EIA. This group

and WGML believed that a Board EIA should be available for all parties to comment on or to dispute where there was disagreement with the Board's preliminary assessment. It was also suggested that if an EIA were done by the Board this should not preclude an applicant from submitting its own study. WGML expressed the view that the parties responsible for the preparation of the EIA should be identified and available for examination both in the pre-hearing and hearing process. Alberta and Southern Gas Co. Ltd. ("Alberta and Southern") raised a similar concern.

Selkirk expressed a similar view about the ability and potential reluctance of parties to rigorously cross-examine Board staff if the EIA were done by the Board. It was also Selkirk's view that a preliminary EIA done by the Board could create the apprehension of bias and would tend to place the Board in the midst of the evidentiary and argumentative aspect of the proceedings. ICG (Ontario) also qualified its support for an EIA done by Board staff by noting that the burden of proof is on an applicant to demonstrate that its proposed export is surplus and in the public interest.

The submissions provided some technical comments on the EIA. ProGas emphasized the need to do the analysis on an aggregate basis rather than on a project specific basis. The company stated

that the details of any model developed by the Board to conduct the analysis should be available to all interested parties and that interested parties should be able to request the Board to conduct the analysis based on alternative assumptions. GMi suggested that for an EIA to be meaningful, a common and accepted set of assumptions and a common methodology is necessary, as is done with the Board's benefit-cost analysis. The APMC argued that the EIA should be limited to identifying negative impacts of exports arising from market failure. The APMC also stated that the EIA as currently applied is inconsistent with the deregulated North American gas market upon which the MBP is premised because it only considers the effects in the Canadian domestic market in isolation from the North American market. The study submitted by Union also raised doubt as to the appropriateness of the partial equilibrium ("PE") approach which measures the price impact and associated changes in domestic supply and demand by incorporating all the adjustments of the impact of an export on the Canadian market only. The study suggested that the EIA should involve a general equilibrium ("GE") approach which would incorporate the impact and adjustments occurring in a North American market. According to this study, this approach may generate smaller price and quantity impacts on the Canadian market than would a PE analysis.

Some submitters argued that in an open market environment, competitive forces and price flexibility will be sufficient to elicit the supply needed to meet demand; hence, an export impact assessment is not necessary because it addresses a non-issue. Other submitters believe that there is a real question about whether the market will necessarily operate on its own and without fail to meet domestic requirements whatever the export level.

It is true that markets have demonstrated much adaptability to changing conditions: there have been large changes in energy consumption patterns over the past few decades yet there have been no supply crises in this country.

It is also true, however, that markets can experience adjustment difficulties for a number of plausible reasons. For example, there have been episodes of short-term energy supply disruption in the U.S. (such as curtailments of natural gas supply in the 1970's), due to a combination of regulatory, market and international circumstances.

The energy industries typically require relatively large investments and long lead times to accommodate changes in supply and demand patterns. Producers and consumers are required to make decisions with foresight, under conditions of considerable uncertainty, about key factors that will affect the viability of the activity they initiate. There is also increasing sensitivity to numerous environmental and other factors affecting the siting and operation of energy supply and transportation systems.

In the Board's view, it cannot simply be assumed that, because there is competition in energy markets, there can never be problems as markets adjust to changing supply and demand conditions. For this reason, the EIA and its subsequent evaluation, which are specifically designed to identify adjustment problems, should not be abandoned.

The underlying premise of the Market-Based Procedure is that, while flexible prices may be normally expected to provide for an adequate balance of supply and demand over time, market failure can occur and there is a need for the Board to assess the likelihood of this happening. Difficulties of adjustment between different levels of supply or demand are in themselves instances of market failure, hence the importance of a mechanism to help identify whether such difficulties may be expected to occur.

The Board cannot agree with the view expressed by some submitters that the continued use of an EIA by the Board in examining gas export applications is inconsistent with the terms of the Free Trade Agreement ("the FTA") and of a deregulated, integrated North American gas market. It is true that in exercising its powers and performing its duties, the Board must give effect to the FTA. However, the FTA does not prohibit the denial of applications for the export of natural gas nor does it relieve the Board of the duty, as stipulated in section 118 of the National Energy Board Act ("the Act"), of satisfying itself that quantities of gas to be exported do not exceed the surplus remaining after due allowance has been made for the reasonably foreseeable requirements for use in Canada. Neither the FTA nor the amendments to the Act consequent thereon preclude the use by the Board of an EIA in carrying out this obligation.

The Board acknowledges the difficulties of reliably identifying potential adjustment difficulties. The object of the EIA is to determine what effects various levels of exports of natural gas will have on supply, demand and price in Canada over time.

Some submitters argued that to determine the impact of various levels of exports, it is preferable to use a "General Equilibrium" (GE) rather than a "Partial Equilibrium" (PE) analytical framework. The analysis contained in Appendix C to the

Board's letter of 7 September was conducted in a PE framework. The main difference between the PE and GE approaches is that in a GE framework the effect of a change in supply or demand conditions in one market feeds back through the pricing system to all related markets, which causes adjustments in those markets that again feed back into the other markets, until all changes settle into a market balance or new equilibrium. In a partial equilibrium framework, a net change in one variable such as exports is assumed to arise out of a change in market conditions, say in the U.S., and the effect of that change is measured as a one-way, final impact on Canadian supply, demand and price conditions. In general, GE frameworks are better able to portray aggregate impacts among related markets, while PE frameworks have the advantage of providing more detailed sector-by-sector insight. In the Board's view both kinds of analyses have their usefulness.

The Board believes there is merit in the suggestion that it conduct these analyses for use by applicants, intervenors and the Board in export licence hearings.

The Board's EIA will address the effects which various levels of exports will have on supply, demand and price in Canada¹. This analysis will be used in export licence hearings to determine whether the proposed exports are likely to cause Canadians difficulty in meeting their energy requirements at fair market prices. This is done by examining how and with what speed the energy supply and consuming sectors would have to adapt their behaviour in order to make the indicated changes in

production and consumption, and to assess whether it is likely that they will be able to make these adaptations as required.

In addition to the representations made that a GE rather than PE approach to EIA would be more appropriate, the Board received suggestions from submitters for improving the usefulness of the EIA.

On the question of the Board's proposal that applications for export volumes of less than 200 petajoules would be exempt from any EIA filing requirements, the Board was impressed by the arguments that the proposed threshold level of 200 petajoules was unduly constraining and weakened the application of the EIA, that threshold limits are undesirable since they provide applicants with the opportunity to arrange their affairs so that an EIA is not applicable, and that the level is arbitrary and discriminatory. In light of the submissions it has received the Board recognizes that any threshold is artificial and should not be maintained.

The Board also sees merit in the suggestion made that in EIA matters consumers have an important interest in whether an export proposal is likely to cause adjustment difficulties. An EIA prepared by the Board and made available to all parties would reduce the burden of EIA preparation for applicants but at the same time allow intervenors or the Board itself to raise any perceived adjustment problems, be they of a supply or a demand-related nature.

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1. Until the Board issues its next analysis, Appendix C to the 7 September 1989 call for comment is to be considered the Board's EIA.

The Board has decided to retain the Export Impact Assessment (EIA) as part of its Market Based Procedure¹ for licencing exports. With its unique focus on identifying potential market adjustment problems, the EIA provides the Board with information important to it in fulfilling its duty, as prescribed in section 118 of the Act, to satisfy itself that quantities of gas to be exported do not exceed the surplus remaining after due allowance has been made for the reasonably foreseeable requirements for use in Canada. Having considered the views expressed by submitters responding to the 7 September 1989 call for comment, the Board is not persuaded that this information can be adequately ascertained by other means.

However, the Board is of the view that the current procedures for introducing EIA evidence into the public hearings where specific natural gas export proposals are examined should be changed. The Board is concerned that the current procedure, which requires an applicant to file a project-specific EIA, addresses only the impact of individual applications, which may be negligible taken one at a time, but which may be more pronounced if a number of them were taken together. Consequently, the Board will no longer require applicants for gas export licences to file an EIA as part of their application. Rather, the Board will periodically produce an EIA using several projections of exports. The study, which will be prepared in consultation with the natural gas industry and other interested parties, will cover long-term natural gas supply, demand, prices and export levels and will endeavour to provide an adequate statement of assumptions and explanation of the analytical technique used.

The Board's EIA will address only the effects which various levels of exports will have on supply, demand and price in Canada². This analysis will

be used in export licence hearings to determine whether the proposed exports are likely to cause Canadians difficulty in meeting their energy requirements at fair market prices.

In the context of the examination of a specific export proposal the Board will append to the Hearing Order its most recent export impact analysis report. Applicants and intervenors will have the option of using the Board's analysis or of preparing and submitting their own as a basis for arguing whether the proposed export will result in adjustment difficulties in Canadian energy markets. The Board and interested parties will be able to refer to the EIA prepared by the Board or submitted by applicants as well as to any other evidence addressing adjustment problems that might be adduced by the applicant or by other parties in determining whether there could be such difficulties. Where an adjustment issue is raised, an applicant will be requested to address the matter. In the absence of any adjustment-related problems being identified by the Board itself in its Hearing Order or in Information Requests to the applicant or being raised by interested parties, the Board will presume that the proposed export would not trigger a market-adjustment problem.

In the Board's view this change in the focus of the EIA is a practical improvement that will allow the Board to continue to carry out its statutory duty with regard to surplus in a manner fully compatible with a market-oriented pricing regime.

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1. NEB Reasons for Decision in the Matter of Review of Natural Gas Surplus Determination Procedures, July 1987.
 2. Until the Board issues its next analysis, Appendix C to the 7 September 1989 call for comment is to be considered the Board's EIA.

This appendix summarizes the views of submitters concerning the proposed amendments to the Export Impact Assessment filing requirements and the Illustrative Analysis on which the Board wished to receive comments.

Canadian Petroleum Association

The Canadian Petroleum Association believes there is no longer any need for analysis such as the EIA in a deregulated natural gas market based on negotiated contracts.

The CPA also believes that elimination of the EIA is desirable because threshold limits provide the opportunity for applicants to arrange export applications in a way which makes the EIA not applicable. It also indicates that the market for natural gas has to be viewed in the North American context.

The Association considers that the other components of the Market-Based Procedure provide the Board with sufficient information to determine whether a proposed gas export is surplus to reasonably foreseeable Canadian requirements.

Independent Petroleum Association of Canada

IPAC believes that a number of developments over the past few years have led to the development of a market where Canadian consumers are well protected regarding price and markets for natural gas.

IPAC suggests that since the signing of the Agreement on Natural Gas Prices and Markets, progress has been made towards the development of a market responsive regime for natural gas. The Complaints Procedure component of the Board's Market Based Procedure and the Free Trade Agreement have provided Canadians with protection as to natural gas prices and markets.

The above comments lead IPAC to conclude that there is no longer a need for export applicants to develop or file an EIA, and that the Board should remove the EIA requirement.

Alberta Petroleum Marketing Commission

The APMC urges the Board to adopt an approach, when reviewing export proposals, which permits competitive forces to be the prime determinant of conditions in the market. Viable opportunities available to exporters should not be restricted as a result of any measures.

The Commission believes that there is a fundamental flaw in the NEB's proposed EIA. The APMC indicates that different market conditions would characterize the situations with and without an increased gas export from Canada in a North American market. As a result, the adjustment in demand would not be in response to higher exports only.

The Commission states that the basic premise of the EIA, which isolates the Canadian domestic market from the North American context is inconsistent with the fundamental premise of the NEB Market-Based Procedure.

Accordingly, the APMC believes that the EIA should be limited to identifying the potential negative impacts of exports arising from market failure; that the EIA must be only one of many considerations in a proposed assessment; and that any EIA filing requirement based on the Board's proposed approach is inappropriate.

Alberta and Southern Gas Co. Ltd.

Alberta and Southern (A & S) questions the need for the EIA in a free market. It agreed with the two major EIA implementation issues identified by the Board in its 7 September 1989 call for comment.

Alberta and Southern recommends that the EIA requirement be eliminated stating that the role of the EIA is inconsistent with a properly functioning market environment and that other information requirements, such as the benefit/cost analysis, provide the Board with adequate information to assess any gas export proposal. In addition, Alberta and Southern found inappropriate the selection of a threshold level of 200 PJ per year to exempt all applications of this magnitude or less from the requirement to file an EIA. It also raises a number of questions about the status of the preliminary EIA, such as whether the assessment would be a Board or a staff document; how the content would be tested; how the model would be validated, and what would be the sensitivity of the model to the assumptions.

Finally, A & S suggests that an EIA study, such as the Illustrative Analysis, could be published as part of the Board's biennial *Canadian Energy Supply and Demand Report*.

Pan-Alberta Gas Ltd.

According to Pan-Alberta, the EIA is a redundant requirement for the protection of Canadian consumers given that prices set in a deregulated market reflect fair market prices. The Complaints Procedure and benefit/cost analysis cover all valid concerns. In addition Pan-Alberta suggests that the EIA is appropriately considered as part of the Board's ongoing monitoring function.

Pan-Alberta supports the idea that the EIA filing requirements should be deleted. However, if the Board decided to retain the EIA requirements, Pan-Alberta recommends that applicants have the option of choosing a Board-prepared EIA, an applicant-prepared EIA or both.

ProGas Limited

ProGas considers that project-specific EIAs undertaken to date provided very limited information, most individual export sales being too small to have a significant impact on gas prices. ProGas goes on to state that an Export Impact Assessment even of a large project where impacts can be detected, is not an appropriate method of evaluating the merits of an export project. It believes that benefit/cost analysis remains the most useful tool for assessing the economic effects of specific export projects. ProGas proposes that if EIA analysis does

have a role, it is one of providing background information similar to that of NEB's periodic *Natural Gas Market Assessment* or *Canadian Energy Supply and Demand*.

Regardless of the future role of the EIA, ProGas submits that the Board should develop a model for EIA and make it fully available to interested parties if they wish to use it.

ProGas believes that a more appropriate role for the EIA would be to assess the impacts of various overall levels of exports. The results of such an assessment could be published in the Board's periodical studies on *Natural Gas Market Assessment* or on *Canadian Energy Supply and Demand*.

Finally, ProGas recommends that the scope of the assessment should be defined to include impacts on the production and transmission sectors.

Amoco Canada Petroleum Company Ltd.

Amoco supports the Canadian Petroleum Association submission.

Canadian Hunter Exploration Ltd.

Canadian Hunter states that the EIA requirements are important as they have a significant effect on the ability to secure long-term licences. However, it supports the concepts laid out in the IPAC submission. IPAC believes that the EIA filing requirements should be eliminated.

Westcoast Energy Inc.

Westcoast agreed that applicants with export projects below 200 PJ per year should not be required to file any EIA. For projects with annual commitments above 200 PJ, it proposed that the Board could make the EIA necessary on a case-by-case basis. However, given today's deregulated environment, and the difficulty of measuring a reliable estimate of the impact of small exports, Westcoast believes that there is no major role for the EIA in the Board's Market-Based Procedure.

JMC Selkirk, Inc.

JMC Selkirk submits that the EIA is no longer a necessary part of the Board's processes. It argues that the original purpose of providing an EIA has been addressed by the Free Trade Agreement's development of a North American energy market.

JMC Selkirk agrees with the Board proposal to limit the EIA requirement to the proceedings where the aggregate of export applications exceeds 200 PJ annually. However, it has serious concerns about the option of the Board conducting a preliminary EIA which would be commented on by applicants and eventually form part of the decision. According to JMC Selkirk this tends to place the Board in the midst of the evidentiary and argumentative aspect of the proceedings and may also create an apprehension of bias. JMC Selkirk believes that even though parties would be given an opportunity for cross-examination, it may not be possible to cross-examine the actual authors of the Board EIA, or parties might be reluctant to cross-examine Board staff.

The submitter also considers that the other alternative of all applicants preparing a joint EIA might be difficult to accomplish in practice.

Accordingly, JMC Selkirk recommends that complainants under the Market-Based Procedure be permitted to file an EIA which can be responded to by the export applicants.

C.G. Edge & Associates Inc.

C.G. Edge & Associates agreed that it is difficult to detect or measure substantial impacts of small export projects. Under this consideration it supported the Board proposal of not requiring any EIA for projects of less than 200 PJ per year.

However the submitter does not think that any export licence applicant should be required to file an EIA. C.G. Edge & Associates argued that an integrated North American gas market is now in place, and this market should function relatively smoothly. Some imperfections might arise from time to time, but these are in its view beyond the scope of an applicant to accurately identify and assess. Furthermore, it believes that the new Canadian exports will have a minimal impact if considered in a North American context.

The submitter suggested that the *Natural Gas Market Assessment* and the *Canadian Energy Supply and Demand* reports are more appropriate vehicles to assess how well the North American gas market is functioning.

Western Gas Marketing Limited

WGML supported the general intent reflected in the Board's draft proposal for amended filing requirements. It particularly supported the filing exemption of exports of less than 200 PJ per year, and submitted that any step towards reducing or eliminating the use of the EIA is positive. However, the submitter considers that the cases in which an EIA is required should be strengthened and clarified. In the event that Board staff prepares a preliminary EIA, the parties responsible should be identified and available for examination. WGML considers that any applicant should have the option of preparing its own EIA and entering that document in evidence.

Western Gas is of the view that once it is demonstrated that a project is in the public interest, all that should then be necessary is to ensure that no domestic user has been unable to contract for gas on competitive terms, and that no major disruption is caused by the export project. Thus, the main purpose of the continued use of an EIA should be to draw attention to major disruptions or adjustment problems that might arise because of market imperfections. WGML feels that if such imperfections cannot be convincingly argued by the Board or intervenors, the EIA should be considered only as part of the monitoring process.

With regard to the Board's Illustrative Analysis, WGML is of the opinion that the emphasis should be limited to the economic, efficient and orderly development and utilization of gas resources. It is also critical of the analysis for linking future Canadian gas price increases to supply cost increases; in the past, gas prices have been determined by regulatory decision and by external shifts affecting the price of other energy forms. The analysis, notes WGML, does not take into account the fact that increased exports, that cause the price to rise, could displace exports to other American markets and thus have only a minor impact, or no impact at all, on prices. Finally, given the poor record in predicting the impact of changes in demand and price on gas reserves and supplies, it may not be reasonable to base the impact of increased exports on long-term forecasts of finding rates and development costs.

Gaz Métropolitain, inc.

Gaz Métropolitain noted that since the Board's decision to adopt the Market-Based Procedure, developments and events such as the increased integration of the North American natural gas market and the GH-10-88 and GH-1-89 hearings have reinforced the importance of the Board exercising its mandate to protect reasonably foreseeable domestic requirements.

Thus, Gaz Métropolitain is opposed to the abolition of the filing requirements for projects below 200 PJ per year. It is the company's view that while it may be difficult to measure the impact of projects of this size, this does not mean there is no impact to assess. GMi believes it is important that efforts be made to develop the EIA so that it is a workable tool and all components of the Market-Based Procedure are fully implemented.

Gaz Métropolitain therefore proposes that Board staff immediately undertake an EIA for a volume of 200 PJ per year, and that this assessment be presented in a workshop to encourage the development in the industry of one method and common assumptions. In the case of a joint application by several applicants, the company indicated that a preliminary assessment prepared by Board staff would be preferable. This assessment should be presented in a workshop before the start of the hearing, and at the time of the decision be modified to incorporate the views of the parties at the hearing.

ICG Utilities (Ontario) Ltd.

ICG has no particular comment on the Illustrative Analysis of the EIA. With respect to the proposed amendments to the requirements, it states it is not opposed in principle to the establishment of a threshold which would determine whether or not an EIA would have to be filed for a particular project. ICG recalls, however, both the size and significance of a proposed export determined the type of analysis to be conducted for an EIA, in the Board's July 1987 Decision.

The company feels that the proposal to limit the EIA to projects that exceed 200 PJ per year implies, by definition, that smaller projects or those structured in such a way as to be exempt from the requirements are not likely, in the Board's view, to prevent Canadians from meeting their energy re-

quirements at fair market prices. ICG feels this proposal unduly reduces the burden of proof borne by an applicant. It placed this proposal of a threshold of 200 PJ in perspective with, on the one hand, the Iroquois and Champlain projects, and, on the other, its anticipated FS deliveries, to show that if the Board does adopt a threshold, it should be significantly lower than 200 PJ.

Based on the analytical and technical skill of the Board, ICG expresses its support for a provisional EIA carried out impartially by the Board, to which would be added the views of the interested parties.

Consumers' Association of Canada (Ontario)

The Association maintains that the proposed amendments to the filing requirements further weaken the Board's protection of Canadian gas users. It also described the Illustrative Analysis prepared by the Board as highly academic, and expressed its concerns about the assumptions used.

The Association maintains that the considerable consequences of guessing wrong on energy matters should prompt the Board to base its study on very conservative assumptions. It therefore criticized the Board for using data on the ultimate natural gas potential of the Western Canada Sedimentary Basin that do not take into account the lack of discoveries in recent years. It denounces the postulate that the remaining reserves will increase and that supply and demand will balance simply by raising prices. The Association also points out the high degree of uncertainty surrounding issues related to the magnitude and development of reserves in frontier areas. Finally, in its view, the Illustrative Analysis assumes that producers will step up their exploration efforts simply to ensure that Canadian gas supplies are able to meet the demand. According to the Association, this implicit assumption fails to recognize the motives and business practices of producers, whose primary objective is to maximize profits.

Finally, the Consumers' Association is of the view that the establishment of a threshold for determining the need to file an EIA would simply result in its elimination.

The Consumers' Gas Company Ltd.

Consumers' believes that the purpose of the EIA as stated in the GHR-1-87 Reasons for Decision is val-

id regardless of the size of the export application. It is accordingly concerned that the Board would exempt export applications of less than 200 PJ per year from the requirement to file an EIA.

Consumers' submits that the Board should consider whether the EIA procedure should be redesigned so that it could achieve its purpose in all instances.

Ontario Ministry of Energy

The Ministry suggests that a review of EIA implementation would be more effective within an overall review of the implementation of the Market-Based Procedure.

With regard to the proposal to exempt projects of less than 200 PJ per year from filing an EIA, Ontario states that it is not opposed to this, provided the Board prepares a preliminary EIA for every application.

It does not think the option of a joint EIA prepared by the applicants is workable.

Finally, the Ministry sees merit in the proposal that the Board periodically update a document similar to the Illustrative Analysis. Parties could submit their comments from that basis.

Union Gas Limited

Union is of the view that in the context of public hearings the three components of the Market-Based Procedure are complementary. The issue of "fair market price" is addressed only through the EIA. The EIA is therefore an essential component of the Market-Based Procedure because reasonable foreseeable needs can only be defined in the context of "fair market price".

The Free Trade Agreement notwithstanding, Union feels that reasonably foreseeable Canadian requirements must be protected by the Board as the NEB Act continues to clearly define the Board's responsibility in this matter.

The company shares the view that there are difficulties in measuring the impact of small export projects, but finds the threshold of 200 PJ per year, below which projects would be exempt from the filing requirements, excessive. In its view, projects of this size can have a significant impact on the price of gas to the detriment of future Canadian requirements.

With regard to the Board's Illustrative Analysis, Union maintains that the partial equilibrium method used may significantly overstate the magnitude of price increases and their impact on Canadian demand. Thus, changes in market prices should be projected based on aggregate sales in the context of a general equilibrium model of the North American market. The analysis should also demonstrate whether the market price at which the gas will be sold is expected to be higher than its marginal replacement cost.

Union recommends that the Board undertake an aggregate EIA of all anticipated exports over a specific time frame. This could initially be done annually, and the projects submitted in that period would be assessed according to this EIA. Interested parties should have an opportunity to participate in this assessment, and also have the option to present new assumptions or information through a project-specific EIA. The Board should formally invite industry to provide information in order to ensure that the EIA model accurately reflects the response to a change in price with respect to domestic supply and demand, and exports.

File No.: 1067-1

Date: 7 September 1989

To: Interested Parties

**Re: Proposed Amendment to Export Impact
Assessment Filing Requirements**

The National Energy Board ("the Board") decided on 3 August 1989 to seek the view of interested parties on a proposed amendment to the impact assessment filing requirements.

In its July 1987 "Review of Natural Gas Surplus Determination Procedures", the Board established an "Export Impact Assessment" (EIA) filing requirement, the purpose of which is "to allow the Board to determine whether a proposed export is likely to cause Canadians difficulty in meeting their energy requirements at fair market prices". (Page 25, attached as Appendix A.) The decision then described the matters which applicants should address in conducting this assessment, without however, prescribing a particular method of implementation.

Two main EIA implementation issues have arisen over the past two years of natural gas export proceedings:

- (1) it is difficult to detect or measure substantial impacts of small proposed export volumes, and
- (2) there appears to be uncertainty on the part of applicants about how best to satisfy the EIA requirement.

The Board proposes to improve the efficacy of the EIA by addressing these two problems with

amended filing requirements and additional guidance to applicants on the conduct of an EIA.

Attached as Appendix B is the Board's draft proposal for amended filing requirements. The intention of this proposal is to limit the preparation of an EIA to those situations in which the assessment is likely to provide useful evidence to assist the Board in satisfying itself that the proposed exports meet the criteria of Section 118 of the NEB Act.

Attached as Appendix C is a Board staff paper titled: "Export Impact Assessment: Illustrative Analysis". The purpose of this paper is to lay out a technical approach for conducting an EIA, and to show the results using two estimates of Western Canadian Sedimentary Basin resources. The paper addresses the price, demand and supply reactions to a large, hypothetical increase of exports and comments on the likely ease or difficulty of these adjustments occurring. The paper is not presented as a Board conclusion about the acceptability of any particular level of exports. It is published only as a technical illustration of one approach to the conduct of an EIA.

The Board welcomes comment on both Appendices B and C to be filed with the Board by September 29, 1989. The Board expects to issue revised EIA filing requirements by early November 1989.

Yours truly,

Louise Meagher
Secretary

Attach(s)

Appendix A to the Board's letter dated 7 September 1989

2) Export Impact Assessment

Applicants for licences to export natural gas will be required to submit an assessment of the impact of their export proposal on Canadian energy and natural gas markets. This impact assessment will be considered at the public hearing convened to examine the application.

The purpose of the impact assessment will be to allow the Board to determine whether a proposed export is likely to cause Canadians difficulty in meeting their energy requirements at fair market prices.

The nature of the export impact assessment, whether quantitative or qualitative, will depend upon the size and significance of the proposed export. The extent and detail of the analysis should be commensurate with the size of the proposed export.

In dealing with the ability of the Canadian gas producing sector to satisfy Canadian needs, given the proposed export, Applicants will be expected to analyze the relevant geological, engineering, economic and institutional factors influencing gas supply. These factors may include the following: exploration and development costs; levels of drilling activity; the trend in reserves additions relative to drilling effort; the size, location and potential production characteristics of gas pools; transportation requirements from wellhead to market and the feasibility of any new transportation facilities required.

In addressing any need for Canadian gas users to adjust their energy consumption patterns by means of energy conservation or switching to alternative fuels, Applicants will be expected to assess the following factors: the scope for additional conservation; the price of gas relative to other energy forms; the fuel-switching capability of Canadian gas users; and any lags in conservation and fuel-switching and the expected costs involved.

Applicants will also be expected to address the impact of their proposed exports on future natural gas prices. Given the uncertainty associated with future values of key factors underlying natural gas supply and demand, such as world oil prices, Applicants will be expected to do the impact assessment using a reasonable range of values for those factors.

The burden of proof will rest with the Applicant to satisfy the Board that the proposed export is surplus. The hearing process will provide all parties with an opportunity to test the Applicant's evidence and to present evidence supporting or opposing the export proposal.

Appendix B to the Board's letter dated 7 September 1989

Revised Export Impact Assessment Filing Requirements

1. All applications for which the annual volume of exports would be sustained at less than 200 PJ per year are exempt from the requirement to file an EIA.
2. For a single hearing which includes more than one application and for which the total of requested exports for all applications in the same proceeding would be sustained at more than 200 PJ per year, either
 - (a) the Board will conduct a preliminary EIA, to be issued to parties with the hearing order as information which parties may use as they see fit; the final EIA will be in the Reasons for Decision and will take account of views of parties;
 - or
 - (b) all applicants will prepare a joint EIA covering the total of requested exports from all of their applications in the same proceeding.

(Normally, the Board would schedule more than one application in the same proceeding if there were common factors making it sensible to do so - for example all applications underlying one facilities expansion application.)
3. Board staff will periodically issue updates similar to the analytical paper in Appendix C, providing a view of potential market adjustment implications arising from anticipated changes of export volumes.
4. EIA submissions will continue to have the content described in Appendix A.

Appendix C to the Board's letter dated 7 September 1989

Export Impact Assessment: Illustrative Analysis

The purpose of this Board staff paper is to assess the impact on Canadian consumers of additional natural gas exports to the U.S. Since July 1987, the assessment of the impact of additional natural gas exports has been one component of the Board's Market-Based Procedure, used for considering the merits of applications for natural gas export licences. This paper is intended to be informative to participants in the Board's hearings and to stimulate public discussion.

The impact we are assessing has several key components:

- 1) incremental exports call forth increasingly costly gas supply over time relative to supply costs without the increment;¹
- 2) the delivered prices of gas to Canadian consumers increase because of the increased supply cost;²
- 3) consumers either conserve on the use of gas or they switch to other fuels as they become more economic for some users;
- 4) this conservation and switching entails an adjustment process which may or may not be easy to achieve;
- 5) development rates of resources are accelerated.

Our analysis measures the extent of each of these reactions to the incremental export. We discuss below the method used; the price, demand and supply results; and our conclusions. We discuss the results for Ontario and Quebec; the changes for all of Canada are shown in the Appendix tables.

Our starting, or base case of natural gas supply, demand, and prices (and of economic growth, and other energy supplies, demands and prices) was based on the Low Case³ in *Canadian Energy Supply and Demand*, September, 1988 ("the Supply and Demand Report"). Because this case has low oil prices, as natural gas domestic consumption and exports cause natural gas prices to

increase, this provokes a larger difference between gas and oil prices and a larger potential consumer response than would have occurred with a starting scenario featuring higher oil prices. The Low Case also has lower commodity (i.e. net of transportation and distribution) prices for industrial gas purchasers than for residential and commercial natural gas customers (so-called price streaming). Streaming may put most of the pressure of adjustment to higher prices on residential and commercial consumers, because residential and

-
1. A possible exception to this proposition is a supply source which requires an export market, failing which the supply source would not be developed, but once developed would provide additional supply to Canadians at a marginal cost which is attractive relative to alternative supplies. Such a supply source may have very high front-end development costs, such that its economic viability depends upon it being able to flow initial volumes of gas exceeding the absorptive capability of the domestic market. For projects of this kind, an Export Impact Assessment using methods illustrated here would require a revision of the supply curve for gas serving the domestic market, to take account of the incremental domestic supply from the time the project would be commissioned, till it would terminate. The later consequences of having used this gas earlier in time than without the export component may happen so much later that domestic users would have ample time to adjust their energy supply portfolios accordingly. In these circumstances, the different timing of resource depletion would be more an issue for cost-benefit evaluation than for market adjustment problems.
 2. With the growing integration of natural gas flows between Canada and the U.S., provided that Canadians can freely trade gas with the U.S., the prices of gas in Canada will reflect supply, demand and consequent price conditions in the U.S. market. This does *not* mean that Canadian prices are "made in the U.S.A." and that Canadian supply arrangements can have no impact on Canadian prices. What it *does* mean is that the more gas both Canadians and Americans consume, and the costlier the marginal resources required to satisfy that consumption, the more expensive will natural gas be for Canadian and American consumers. The marginal resource may be Canadian, or American, or both, depending upon the optimal sourcing between particular supply and demand regions. The impacts of both increasing North American demand and Canadian exports on Canadian prices is best estimated using a gas flow modelling framework which integrates supply, demand and transportation characteristics across North America, and which portrays market behaviour on the basis of economic principles which are reasonable given the trade policy environment.
 3. The starting scenario is the low case in the report modified by fully iterating it to balance the market to reflect the final export volumes in that report (see table A6-10 and footnote [a] to that table on p. 325).

commercial prices must increase more than proportionately in order to maintain industrial prices at or near parity with heavy oil.¹

Furthermore we have selected for our impact case a reasonably large export increase. In both the high and low scenarios of the 1988 Report, exports attain and remain at about 1 450 PJ per year, compared with 1987 exports of about 1000 PJ and 1988 exports of about 1 300 PJ. On top of the 1 450 PJ projected in the Supply and Demand

Report, we add another 550 PJ, bringing Canadian exports to about 2 000 PJ by 1992 (about twice their 1987 level within five years). The difference this makes to cumulative exports is that between 1988 and 2005, instead of the 26.7 EJ of cumulative exports in the base case, we have 34.4 EJ in the impact case, a difference of 7.7 EJ, which represents about 17% of base case reserves additions over the study period. This would boost Canadian gas exports toward the upper end of the range foreseen by other analysts.

Both the choice of the starting (base) case and the size of additional natural gas exports provide conditions which should make for a good test of the capability of energy market adjustment.

Natural Gas Exports Range of Views

	(Bcf) Year 2000
CERI	
High	2 000
Low	640
The WEFA Group	1 900
DRI	1 831
EIA	2 500
GRI	1 600
EM&R	1 500
EMF	
High	2 000
Low	500

Legend:

CERI = Canadian Energy Research Institute, February 1988, Study No. 26, p. 18.

The WEFA Group = Energy, Metals and Minerals, The WEFA Group U.S. Energy Forecast, Summer 1988 p. 7.81.

DRI = Data Resources Energy Review, Summer 1988, Volume 12, Number 2, p. 65.

EIA = Energy Information Administration, Annual Energy Outlook 1987, Table A9.

GRI = Gas Research Institute, 1988 Baseline Projection of U.S. Energy Supply and Demand to 2010.

EM&R = Energy, Mines and Resources Canada.

EMF = North American Natural Gas Markets: EMF 9 Summary Report, Energy Modelling Forum, Stanford University, Stanford, California.

(From *Canadian Energy Supply and Demand*, Sept. 1988, p. 127, inset table).

The methodology for balancing natural gas supply, demand and prices is that described in the Supply and Demand Report. We first measure the impact of the increased production needed for additional exports on Canadian gas supply costs. We then project new prices for the period to 2005 based on these costs and re-estimate Canadian gas demand using these prices. We iterate between the supply and demand models until there emerges one price track at which the amounts supplied and demanded are the same. We then compare gas prices, gas demand and competing fuels demands between the base and the impact case.

We do not test whether at these prices the assumed 2 000 PJ/yr export would be fully sellable in the U.S. market; for present purposes we assume it will be. The aim of the exercise is not to assess

1. In a case where natural gas prices are streamed, the commodity price to residential and commercial consumers exceeds that to industrial consumers and exceeds the average wellhead price. In a no-streaming case, the commodity price is equal to the wellhead price for all sectors, but since industrial gas demand may be lower (than in a streaming case) transportation and distribution costs are higher to residential and commercial consumers than in the streaming case (the gas market is smaller). Streaming puts the most pressure of adjustment on residential and commercial users only if the difference between the commodity gas price and average wellhead price for these sectors in the streaming case exceeds the difference between the transportation and distribution cost from the streaming to no-streaming case. For example, in the 1988 Supply and Demand Report low case, we found that Ontario residential consumers would pay about 6.5% more with streaming than without it (see "Canadian Energy Supply and Demand 1987-2005", page 32).

whether the high export case is likely, but rather to evaluate the issue of its impact on the Canadian market should it occur.

The gas supply analysis has been conducted using two supply scenarios for the Western Canada Sedimentary Basin.

The Average Resource Case is based on an ultimate technical resource potential of 225 EJ, which corresponds to an economic potential of 205 EJ. This is the GSC's average expectation (i.e. 50% probability estimate) of natural gas potential for the basin derived from a rigorous geological and statistical analysis.

Given the uncertainty regarding the ultimate natural gas potential, a Low Resource Case has also been evaluated. This is based on the GSC's high probability estimate (>95% probability) of 190 EJ technical potential for the WCSB. The corresponding economic potential is 180 EJ.

Supply costs are consistent with those used in the 1988 Supply/Demand Report (low case) and are presented in Figure S-1 for both the Average and Low Resource Cases. These unit costs are used as the basis for the estimation of fieldgate prices. The lower resource potential carries with it an expectation of higher supply costs, while a higher potential would imply lower costs. A high ultimate potential case was not considered because lower gas costs imply less need for adjustment.

The supply analysis also requires that supply costs be provided for frontier natural gas. For the purposes of this analysis, it has been assumed that supply of 0.5 EJ/YR would be available from each of six pipeline projects at supply costs ranging from \$2.50/GJ to \$4.60/GJ (1987\$). The supply costs for the initial project are based on the Esso/Shell/Gulf applications. It should be noted that the supply costs for the remainder of the projects, while thought to be representative of the cost range which would likely be appropriate for frontier supply, are considerably more speculative than those which have been provided for the WCSB and should only be considered to be illustrative.

The results for the Low Resources scenario, shown in the lower half of Appendix Tables 1 to 4, are based on a new base case¹ with the same export levels of about 1450 PJ used in the average re-

source case, but with the low resource supply cost profile (labelled 190 EJ) shown in Figure S-1.

Results - Prices

- (1) In the *average resource scenario* the price impacts are noticeable. The Ontario residential sector (Figure 1)² natural gas price increases between 1987 and 2005 at about 2.7% per year in the high export (impact) case, compared with about 2% per year in the base case. In any year between 1995 and 2005, natural gas ranges from about 9% to 14% more expensive than in the base case for Ontario and Quebec households (Figure 2).

In the *low resource scenario*, the natural gas price increases at about 2.6% per year in the base case and 3% per year in the high export (impact) case. In any year between 1995 and 2005, natural gas ranges from about 7% to 12% more expensive with high exports than with lower exports. (Figures 3 and 4)

Ontario and Quebec residential consumers in the year 2000 would pay 25% more for their natural gas in a high export/low resource world than they would in a lower export/average resource world. The difference is 23% in 1995.

-
1. Comparing the two base cases, shows the impact on prices and demand of lowering the resource estimate, assuming no difference in the level of exports (1450 PJ). For example, in the Ontario residential market, in the year 2000, the burner tip gas price is \$7.68 per GJ in the low resource scenario, versus \$6.92 per GJ in the average resource scenario, a difference of about 11%. Consequently, gas demand is 267 PJ in the low resource scenario rather than 295 PJ, a difference of 9.5%. The lower resource expectation implies higher costs, higher prices and reduced demand. (It is reasonable to expect that with higher costs of a scarcer resource, export demand would fall below the 1450 PJ feasible with a lower cost resource, mitigating the extent of the domestic price increase and demand decrease. These consequences can be assessed using a general equilibrium modelling framework of the Canadian and U.S. gas markets; we did not do this, hence our present approach slightly exaggerates domestic price impacts in the low resource scenario).
 2. Commercial sector price impacts are similar. The industrial sector is of little interest to this analysis, which focuses mainly on substitution between gas, oil and electricity as a result of changing relative prices. The relative price to industry of gas and oil is held at parity by price streaming in both the base and impact cases.

- (2) In the *average resource scenario*, price ratios between gas and competing fuels also increase. Gas prices remain below electricity prices in the high export (impact) case for Ontario (Figure 5) till very near the end of the study period when gas becomes costlier than electricity, but by only 3%. In Quebec, gas prices exceed electricity prices several years earlier than in the base case. (Figure 6)

Gas becomes costlier than light fuel oil some years earlier in both provinces under the high export conditions.

These general observations also apply in the *low resource scenario*; however, in this case gas becomes even more costly than competing fuels relative to the situation in the average resource scenario, as illustrated by the table below:

**Ratio of Gas to Light
Fuel Oil Prices in 2000**

		Resource Expectation	
		Average	Low
Ontario	(1 450 PJ export)	.90	1.00
	(2 000 PJ export)	.98	1.12
Quebec	(1 450 PJ export)	1.09	1.21
	(2 000 PJ export)	1.19	1.37

(See also Figures 7 and 8)

Results - Demand

- (3) In the *average resource scenario* for the *residential sector total residential energy demand* is lower in 2005 by about 2.5% in Ontario (Figure 9) and 0.5% in Quebec (Figure 10) in the high export relative to the base case. The impact is greater in Ontario than in Quebec because natural gas has a larger share of Ontario's residential energy market than of Quebec's.¹ The difference in demand for electricity between the two cases is negligible in both provinces. In both the base and impact cases, demand for light fuel oil (LFO) decreases from 1987 consumption levels; however, the rate of decrease is lower in the high export (impact) case than in the base case. As a result, demand for light fuel oil is greater in the impact case than in the

base case, starting from about 20% greater in 1995 and reaching about 50% greater in 2005. However, even by 2005, impact case LFO demand is still below 1987 levels.

In the *low resource scenario*, total domestic energy demand differs by very little between the two cases by 2005 in both provinces. In both provinces the base and high export (impact) cases both exhibit heavier reliance on LFO than would occur in the average resource scenario. In Ontario, residential LFO demand in 2005 would be close to the 1987 level. In Quebec, LFO demand would be about two-thirds of the 1987 level in the high export (impact) scenario, while it would be a bit less than half the 1987 level in the base case. (Figures 11 and 12).

- (4) For the *commercial sector* in the *average resource scenario*, overall energy demand is slightly lower in 2005, by only about 2% in Ontario (Figure 13) and 1.4% in Quebec (Figure 14) in the high export (impact) case relative to the base case. (Natural gas has a larger share of Ontario's than of Quebec's commercial sector energy market, hence the impact on total energy demand of an increase in natural gas prices is greater in Ontario than in Quebec.¹) There is virtually no difference in demand for electricity between the base and impact cases. Natural gas demand is lower in 2005 by about 5.3% and 6.4% in Ontario and Quebec, respectively, in the high export case relative to the base case. Oil product demand falls in both cases between 1987 and 2005, but by much less in the high export case than in the base case. By the year 2005, high export case oil product demand is about 28% and 9% greater than base case demand in Ontario and Quebec respectively.

In the *low resource scenario*, there is very little change in overall Quebec and Ontario commercial energy demand between the impact and base cases. By 2005 provincial natural gas demand in the high export case is about 4% below base case levels. Ontario oil

1. For a given variation in the price of natural gas in a particular sector and region, a larger share of natural gas leads to a larger impact on the average energy price. Thus the decline in energy demand is greater in Ontario than Quebec.

product demand falls by 10% in the base case between 1987 and 2005, but increases to between 5% and 10% above the 1987 level in the high export (impact) case. In Quebec, oil product demand in 2005 is about 8% below the 1987 level in the base case, but at the 1987 level in the high export case. Between 1995 and 2000, Quebec commercial oil demand is about 4% above the 1987 level in the high export case. (Figures 15 and 16)

- 5) For Canada as a whole, in the **average resource scenario** total end use energy demand, excluding the transportation sector, is lower in 2005 by 0.9% in the impact case relative to the base case (Table 1). Natural gas use is relatively lower by 4.3% and oil use is relatively higher by 4.3%. The required in-

crease in the gas supply is less than the increase of exports because increasing gas prices cause domestic gas demand to fall and demand for oil products to increase. The increase in demand for oil products is less than the decrease in domestic gas demand because higher gas prices cause not only fuel switching, but also conservation.

Total energy demand, again excluding the transportation sector, in Ontario is relatively lower by 0.9%, and in Quebec, by only 0.3%.

In the **low resource scenario** the changes in total energy demand are also very small.

Results - Supply

- 6) In the control case of the **average resource scenario** (225 EJ), productive capacity increases to approximately 4.7 EJ per year by 2005, and remain relatively constant thereafter, to sustain fixed export level of 1.5 EJ per year (Figure S-2). To sustain the impact export level of 2.0 EJ per year, the productive capacity increases to approximately 5.2 EJ per year by 2005 and remain at approximately that level thereafter (Figure S-3).

This projection of productive capacity requirements has implications for both the level of drilling activity in Western Canada and for the pace of frontier development activity.

In the control case, exploratory drilling levels in the WCSB are projected to increase to a sustained level of approximately 4.5 million metres per year (Figure S-4). This is a high level of drilling activity, but is lower than historical peak activity. In the impact case, exploratory drilling levels of 5.5 million metres per year would be required by the late 1990s, with modest increases thereafter. This level of exploratory drilling, which would be required on a sustained basis, is higher than the peak exploratory drilling level of 5.3 million metres per year which occurred in 1980.

At sustained export levels of 1.5 EJ per year, frontier supplies from the Mackenzie/Beaufort region become economic in 2001. Beyond that point there is an increasing reliance on frontier supplies, to the extent that four or five major frontier projects would be required by

Table 1
Summary of Changes ¹
(PJ)

Average Resource Scenario

Domestic Demand	1995		2000		2005	
	PJ	(%)	PJ	(%)	PJ	(%)
Natural Gas	-69	-3.2	-76	-3.2	-110	-4.3
Oil	26	2.4	35	3.1	50	4.3
Total ²	-45	-0.7	-39	-0.6	-60	-0.9
Natural Gas Exports	+550	38.0	+550	38.0	+550	38.0
Natural Gas Production*	+501		+494		+459	

Low Resource Scenario

Domestic Demand	1995		2000		2005	
	PJ	(%)	PJ	(%)	PJ	(%)
Natural Gas	-65	-3.0	-74	-3.2	-77	-3.2
Oil	26	2.3	34	2.8	39	3.2
Total ²	-39	-0.7	-40	-0.6	-38	-0.5
Natural Gas Exports	+550	38.0	+550	38.0	+550	38.0
Natural Gas Production*	+505		+496		+493	

1. High export (impact) case minus base case. The percentages show corresponding differences as a percent of the base case.

2. Excludes transportation sector.

* Gas production includes shrinkage

Source: Appendix 1, Table 4, Canada, natural gas and oil products

the end of the projection period. In the impact case, frontier supplies become economic in 1999 and all of the speculative projects would need to be developed by the end of the period to provide sufficient supply to meet the projected demand levels.

- 7) In the base case of the *low resource scenario* (190 EJ), productive capacity increases to approximately 4.7 EJ per year by 2005 and remains relatively constant thereafter to sustain the export level of 1.5 EJ per year (Figure S-5). To sustain the impact case export level of 2.0 EJ per year, the productive capacity increases to a level of approximately 5.2 EJ per year by 2005 and remains at that level on a sustained basis (Figure S-6).

Exploratory drilling levels in the WCSB are projected to increase to 5.5 million metres per year in the base case. In the impact case, exploratory drilling levels increase to about 6.5 million metres per year. In both cases, sustained levels of activity are significantly higher than they have been historically in the WCSB and exceed the peak levels achieved in 1980.

In order to meet the projected productive capacity requirements, an aggressive program of frontier development is required in both cases. In the base case, two frontier projects would have to be completed by 2005 and all of the speculative projects would be onstream by 2016. In the impact case, start-up of the first frontier project would be in 1996, with three projects onstream by 2005 and all of the projects onstream by the end of the projection period.

Conclusions

The results of our analysis suggest several tentative conclusions.

If Canadian natural gas resources are found in concert with the GSC average resource expectation, a large, sustained increase in gas exports may cause some domestic gas price increases, but is not expected to lead to major consumer adjustment difficulties. Residential and commercial natural gas prices should rise by about 15 percent by 2005 on account of the higher exports, resulting in a reduction of total energy demand (exclusive of transportation) of less than 1 percent and a substitution of some natu-

ral gas use by oil products. The relative increase in oil product demand is only up to some 4 percent and results in less decrease over time in oil product demand than is otherwise expected to occur.

Consumers have little incentive to change consumption patterns abruptly because of small differences in the rate of fuel price change, or to accelerate switching between fuels unless gas becomes considerably more expensive than competing fuels. Consumer response to the price change is expected to be gradual and lagged, because the incentive to switch fuels requires a sustained price advantage sufficient to compensate for an earlier timing of equipment change than would occur in the base case.

Of course, the extent of the gas supply cost increase, and the extent of consumer reaction to increased gas prices depends largely upon our estimates of the responsiveness of supply and demand to price. Different estimates of this responsiveness would produce different impacts.

The preceding analysis suggests that the supply side should be the primary focus of attention when considering adjustment difficulties.

In all cases which were examined, there is an increasingly heavy reliance on frontier supplies to maintain productive capacity in the period beyond 2000. The extent to which this dependency exists is related primarily to the ultimate resource potential estimated for the WCSB.

Ultimate potential estimates used in this analysis are based largely on existing GSC work and range from 190 EJ (high probability estimate) to 225 EJ (average expectation estimate). This is the range of estimates used in the 1988 Supply/Demand Report, with the base case being the 225 EJ case. The GSC is currently reviewing their natural gas potential estimates, which may lead to an upward revision. However, at this time we consider this to be an appropriate range for use in the examination of the potential for adjustment problems to occur as a result of increased export levels.

Considerations in establishing whether adjustment problems will occur with respect to supply availability from the WCSB include the following:

- the quality and distribution of remaining ultimate potential,

- the capability of the industry, both in terms of physical equipment and skilled personnel, to initiate and maintain the levels of exploratory drilling activity required to sustain productive capacity, and
- lead times for development, particularly in environmentally sensitive areas.

In both the average and low resource scenarios, substantial frontier development activity must occur in the period beyond 2000 in order to provide sufficient productive capacity, particularly in the high export case. The analysis therefore suggests that the pace of frontier development will be a key determinant in assessing whether adjustment problems will occur. Considerations in this regard include the following:

- distribution of reserves, both in terms of geographical area and pool size,
- development costs, which to a large extent will be affected by technological advances over this period, and
- environmental issues - much of the remaining potential is in the more remote offshore areas and the Arctic Islands.

There is a high degree of uncertainty associated with many of these issues and therefore some doubt as to whether the level of development suggested by this analysis can reasonably be expected to occur in the timeframe required.

Particularly because of the above-mentioned uncertainties about the viability of the supply arrangements needed to support these levels of consumption, it could be that this analysis understates potential adjustment requirements.

For example, if it were simply not possible to sustain these levels of supply at the time they would be needed, the supply curves underlying gas price formation would be steeper - meaning less quantity available at higher prices, which in turn would imply more demand-side adjustment that portrayed in this analysis.

Therefore, while the paper indicates perhaps a greater level of concern about supply-side rather than demand-side adjustment difficulties, both are related; hence we eschew firm conclusions about whether exports in the range of 2 EJ/year could be sustained without causing some concerns about the adequacy of adjustment processes.

While we can produce quantitative estimates of the size of price, supply, and demand impacts for every year of the projection, it requires additional qualitative information and judgement to measure the ease or difficulty which may be associated with these adjustments. In general, the ease or difficulty of adjusting depends upon the size and abruptness of the required adjustment, and the kind of energy involved.

Figure 1
RESIDENTIAL SECTOR NATURAL GAS PRICE - ONTARIO

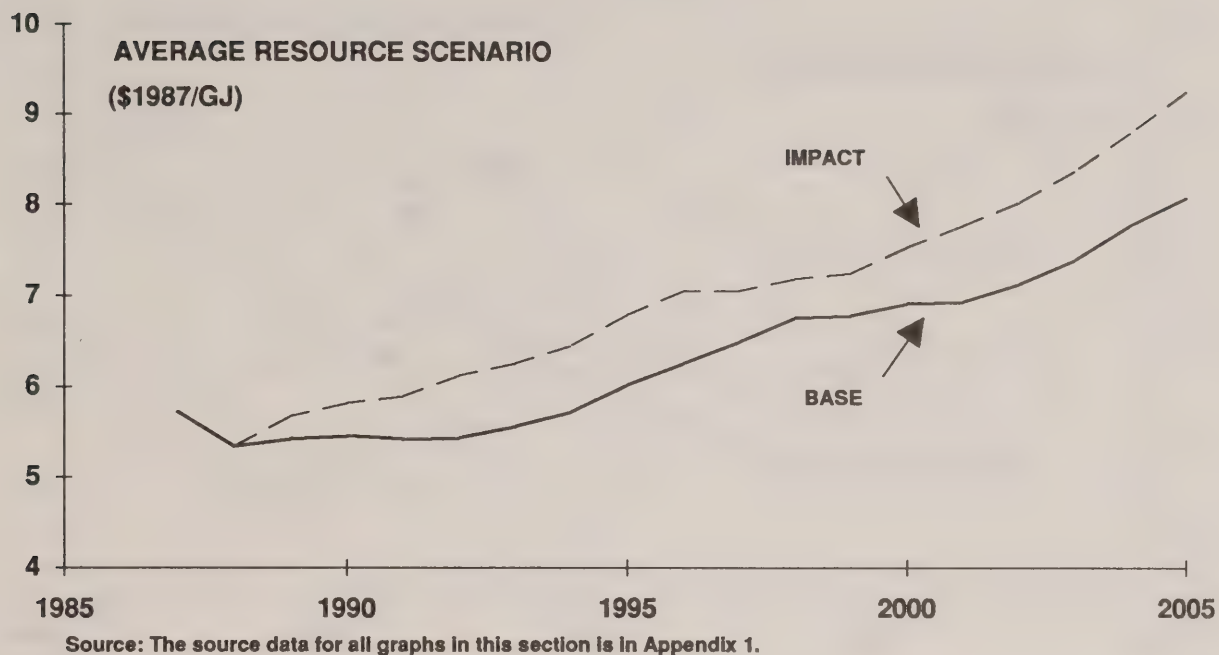


Figure 2
RESIDENTIAL SECTOR NATURAL GAS PRICE - QUEBEC

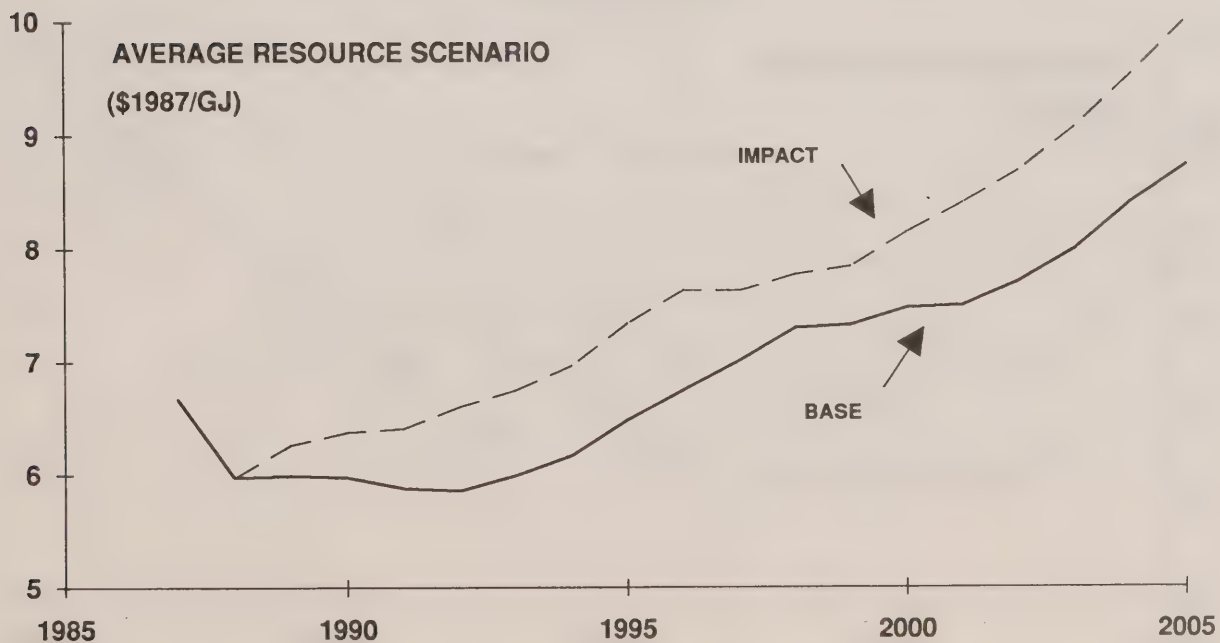


Figure 3
RESIDENTIAL SECTOR NATURAL GAS PRICE - ONTARIO

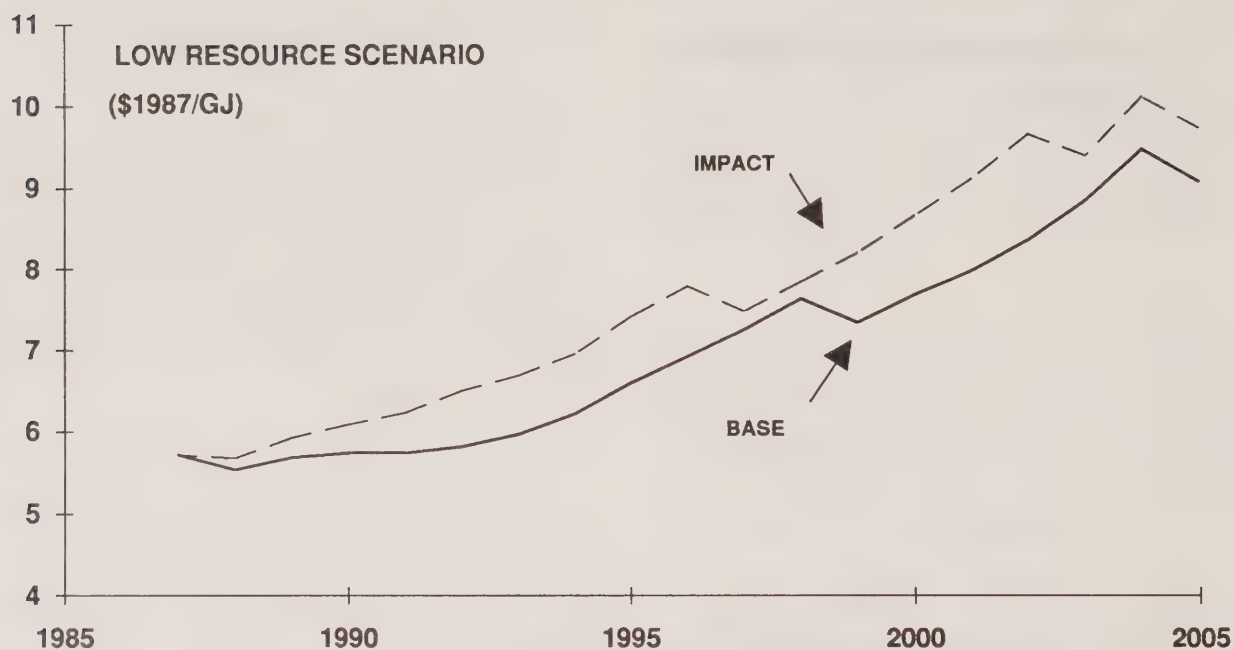


Figure 4
RESIDENTIAL SECTOR NATURAL GAS PRICE - QUEBEC

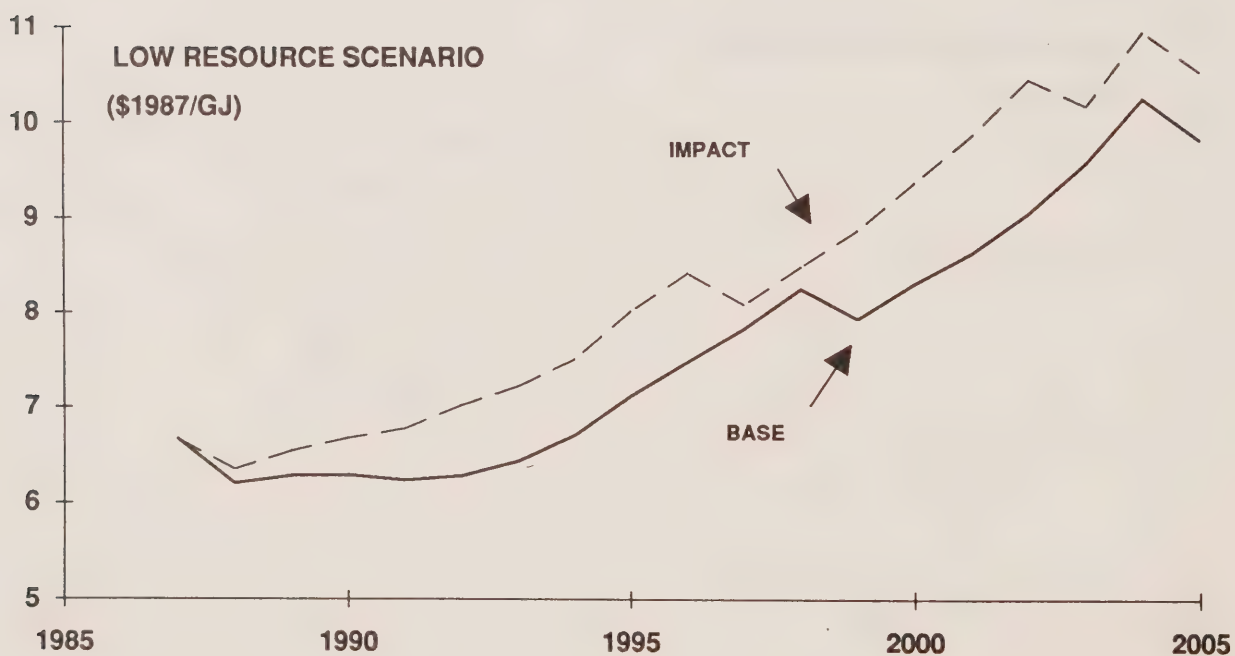


Figure 5
RELATIVE PRICE RATIOS - ONTARIO
RESIDENTIAL

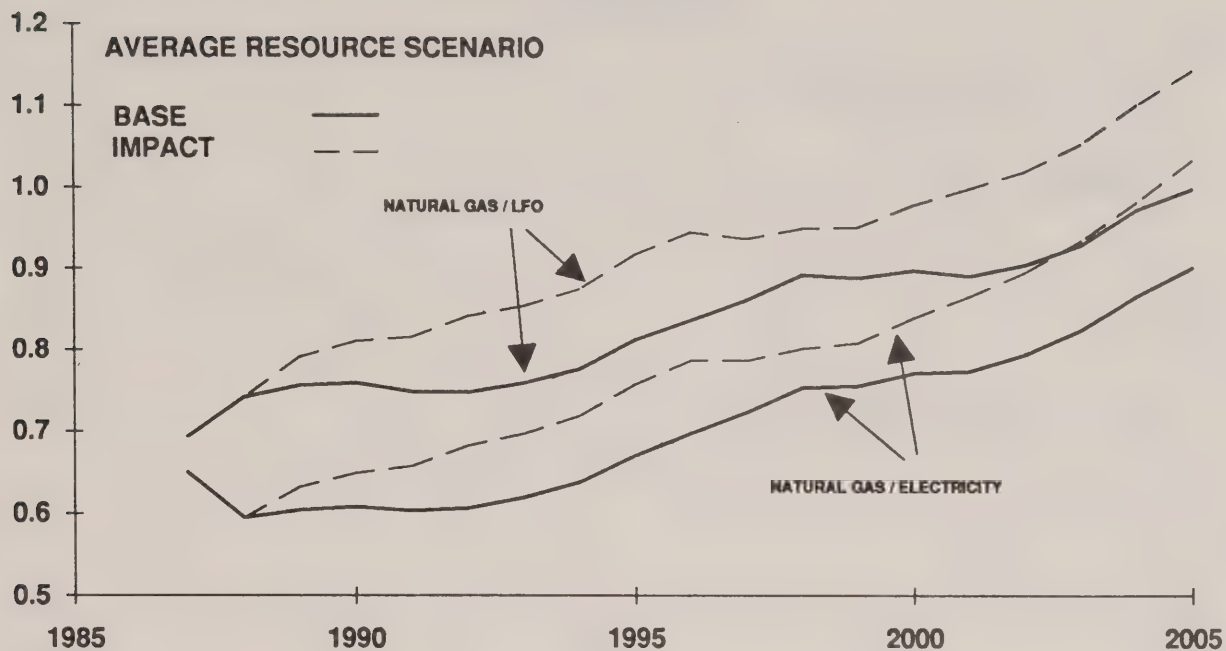


Figure 6
RELATIVE PRICE RATIOS - QUEBEC
RESIDENTIAL

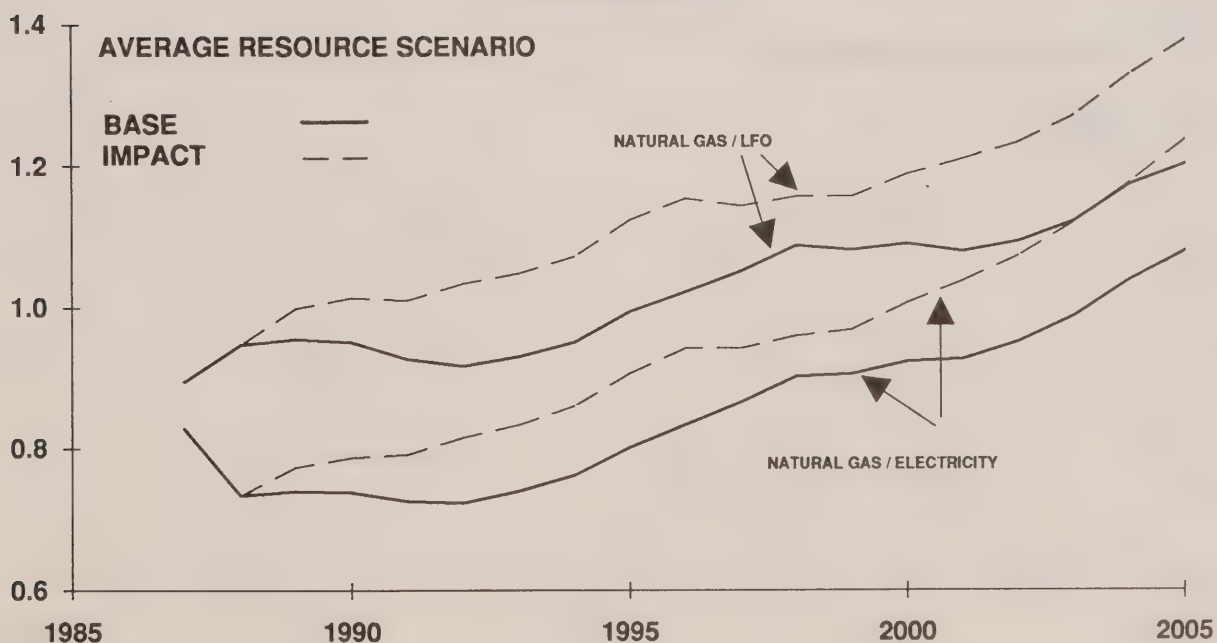


Figure 7
RELATIVE PRICE RATIOS - ONTARIO
RESIDENTIAL

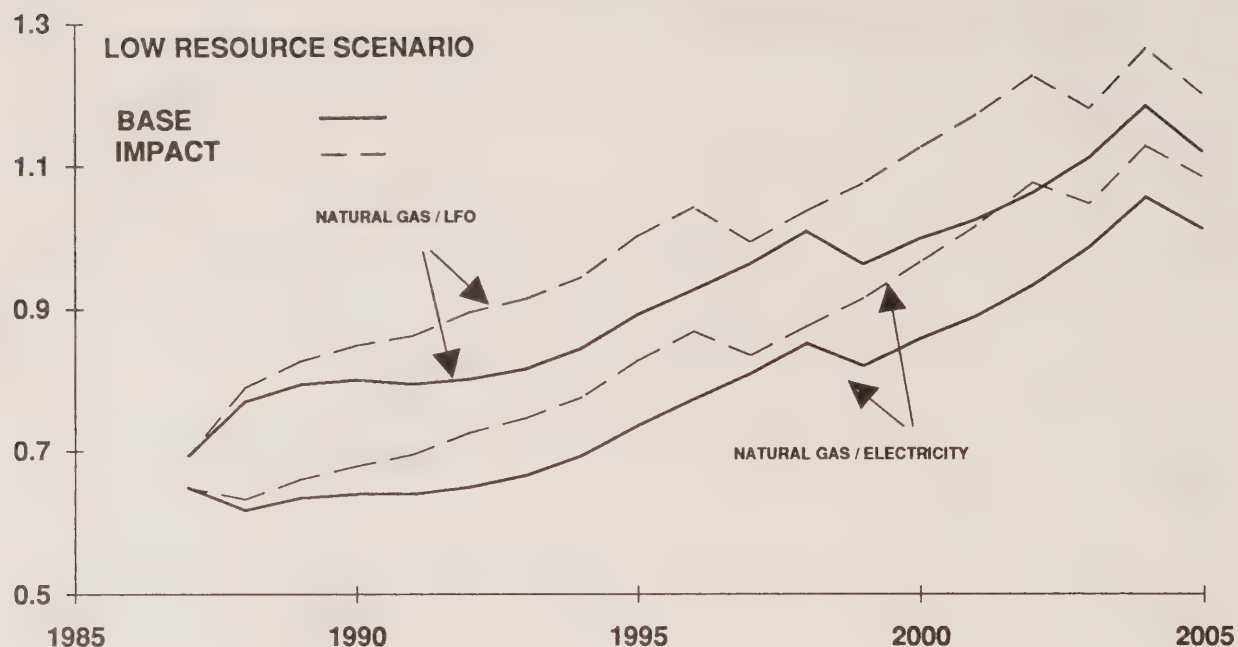


Figure 8
RELATIVE PRICE RATIOS - QUEBEC
RESIDENTIAL

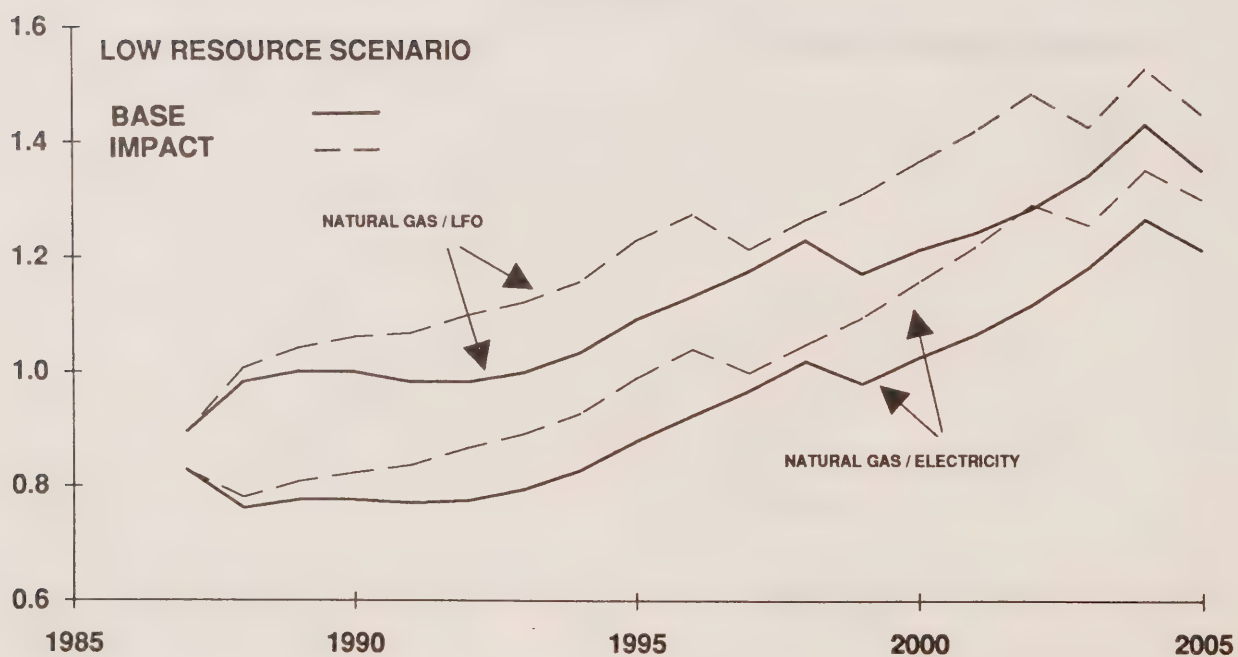


Figure 9
RESIDENTIAL ENERGY DEMAND - ONTARIO
PETAJOULES

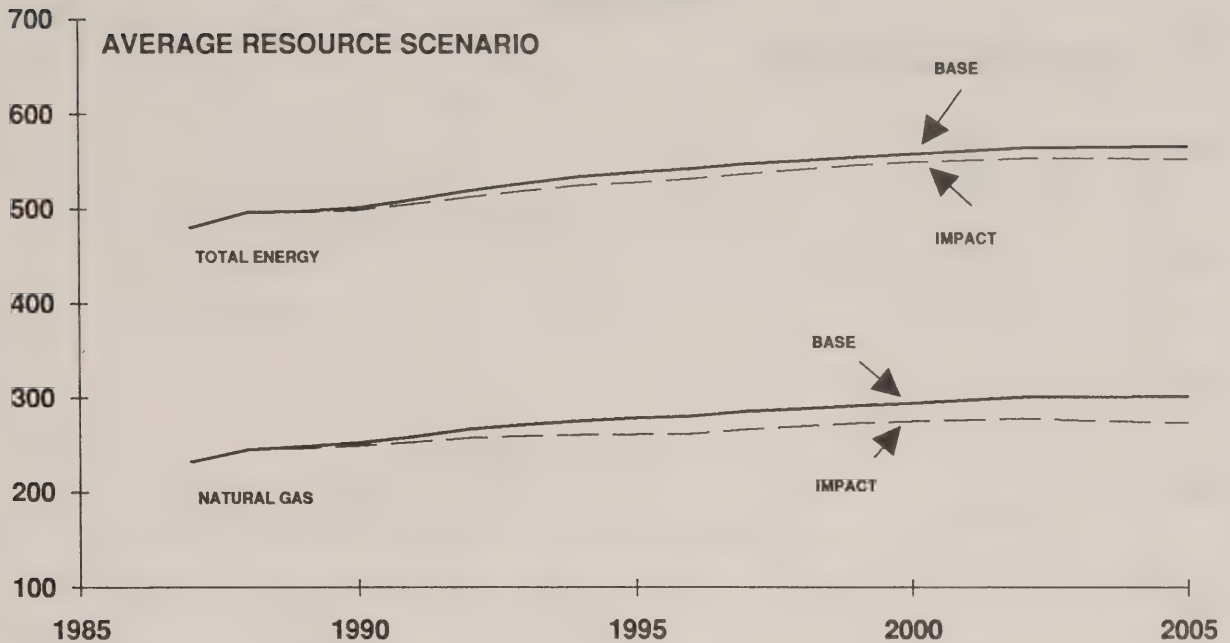


Figure 10
RESIDENTIAL ENERGY DEMAND - QUEBEC
PETAJOULES

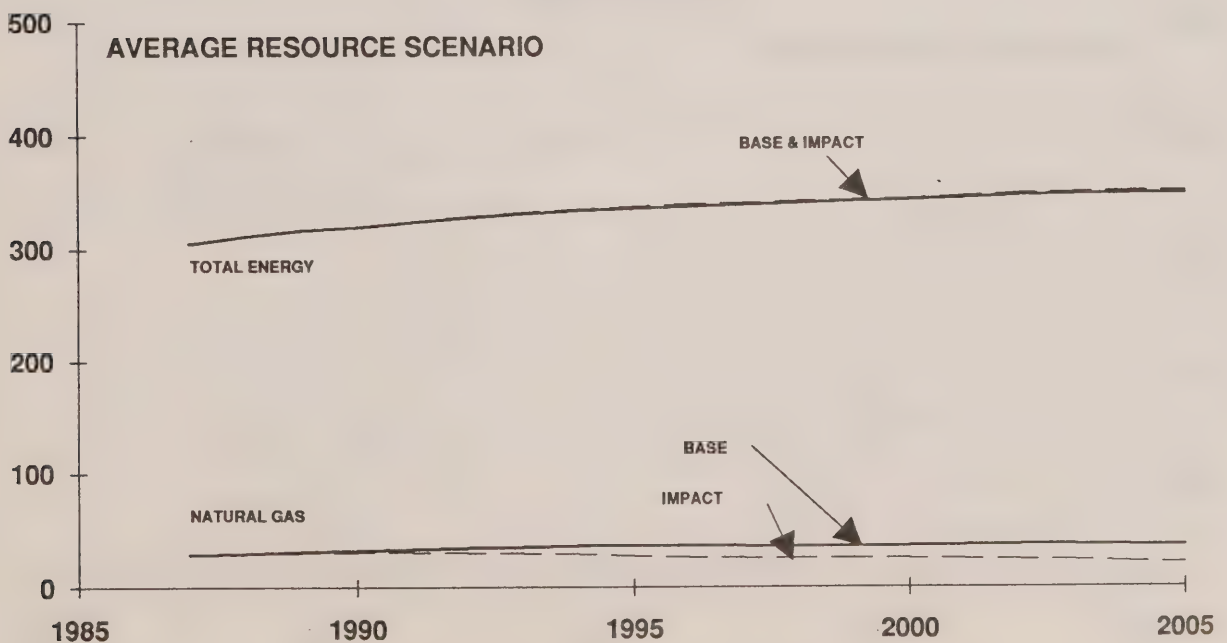


Figure 11
RESIDENTIAL ENERGY DEMAND - ONTARIO
PETAJOULES

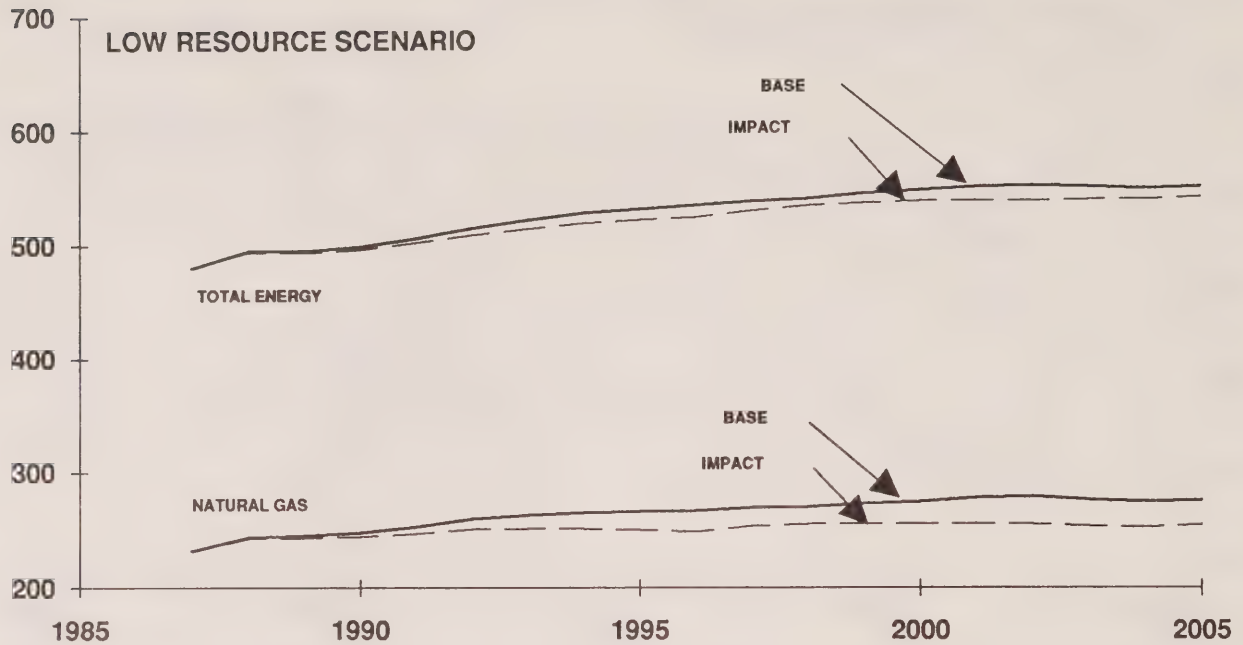


Figure 12
RESIDENTIAL ENERGY DEMAND - QUEBEC
PETAJOULES

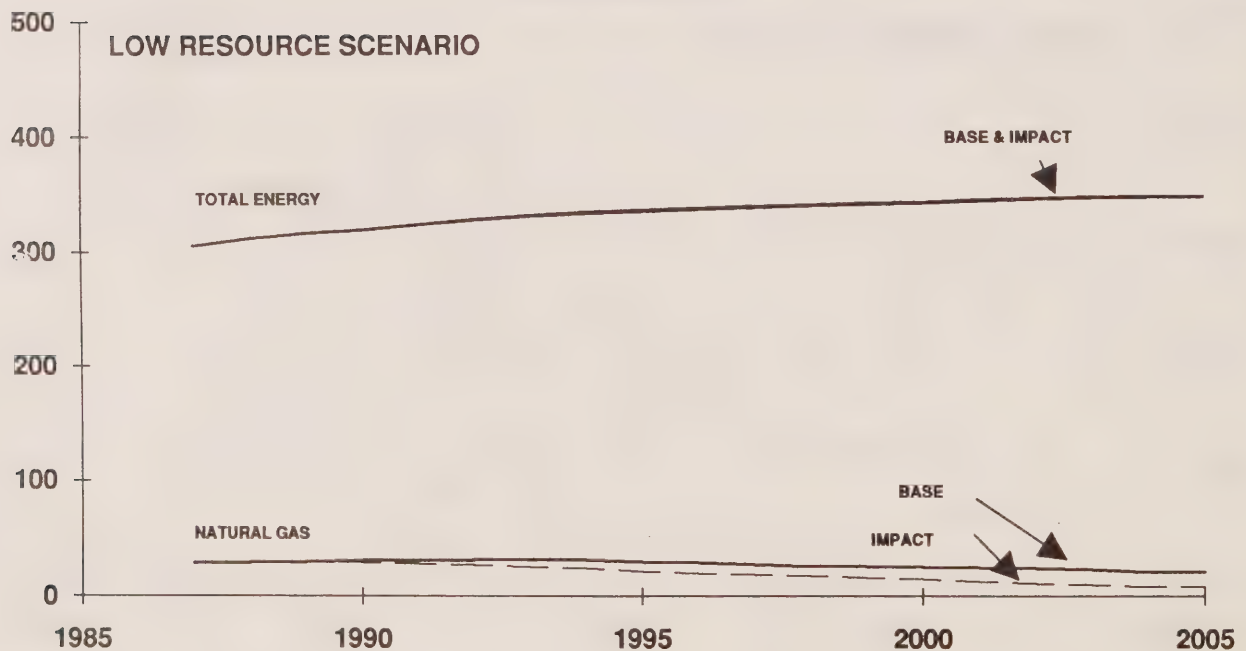


Figure 13
COMMERCIAL ENERGY DEMAND - ONTARIO
PETAJOULES

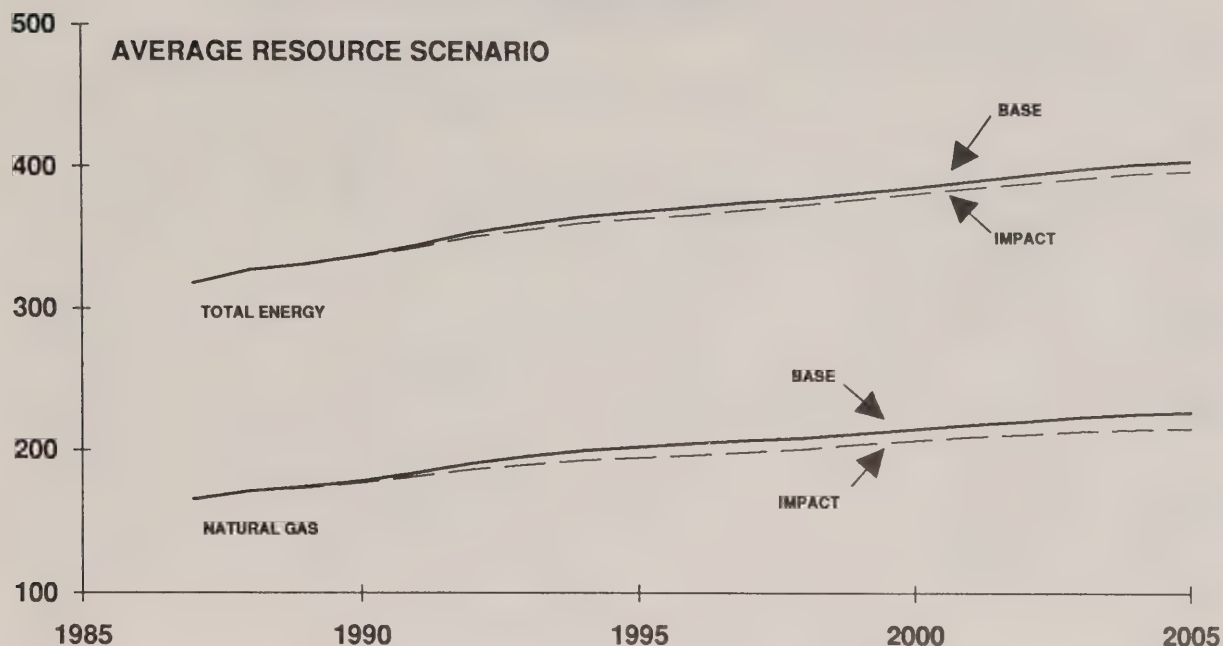


Figure 14
COMMERCIAL ENERGY DEMAND - QUEBEC
PETAJOULES

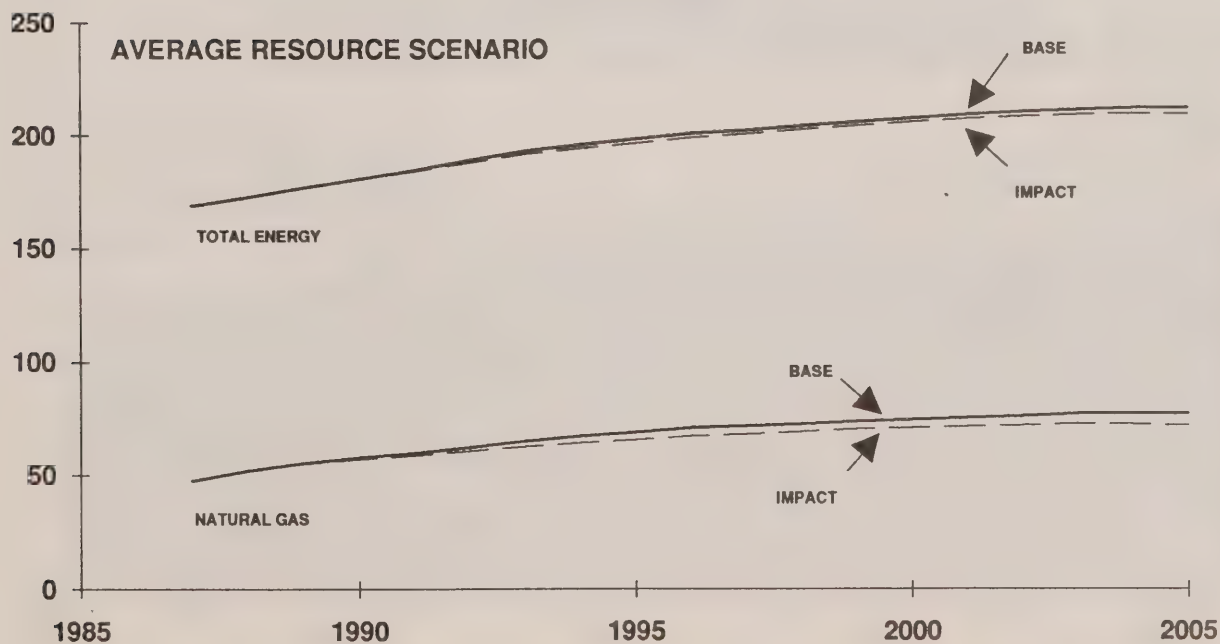


Figure 15
COMMERCIAL ENERGY DEMAND - ONTARIO
PETAJOULES

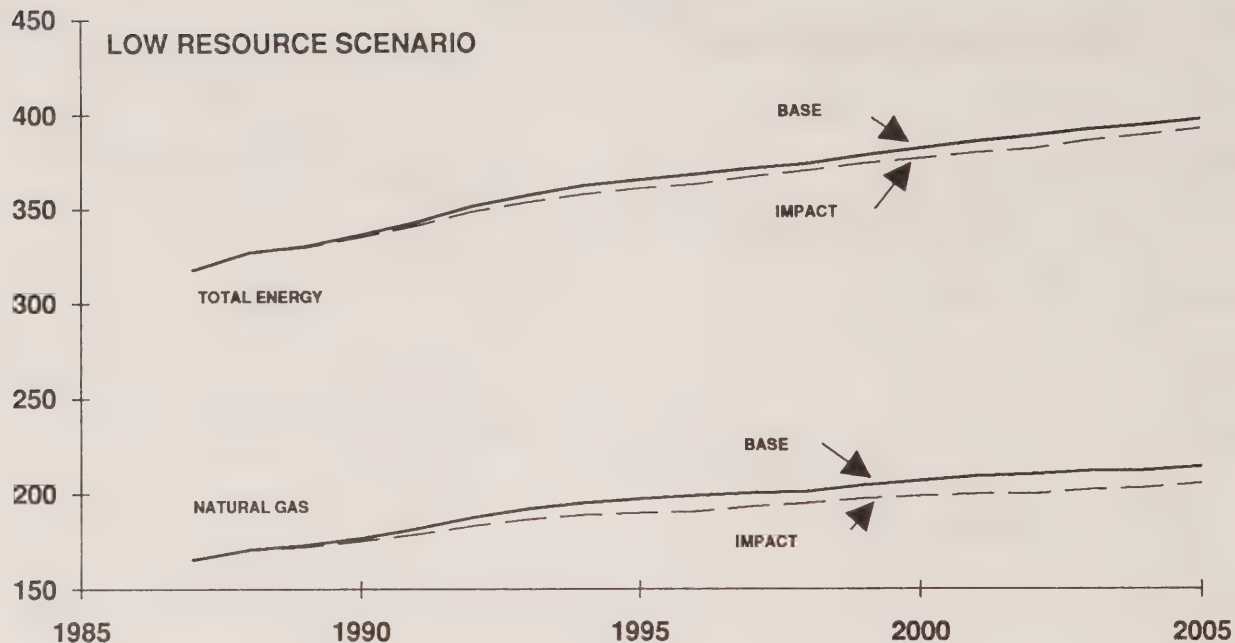


Figure 16
COMMERCIAL ENERGY DEMAND - QUEBEC
PETAJOULES

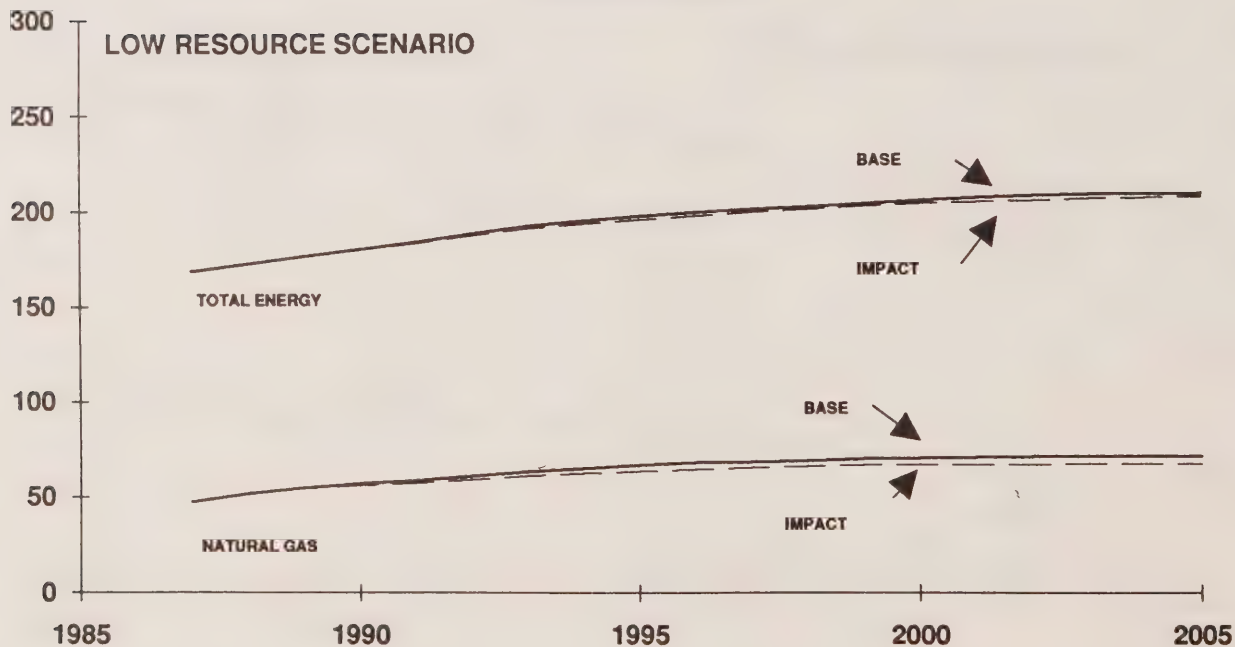


Figure S-1

Net Incremental Direct Costs Western Canada Sedimentary Basin

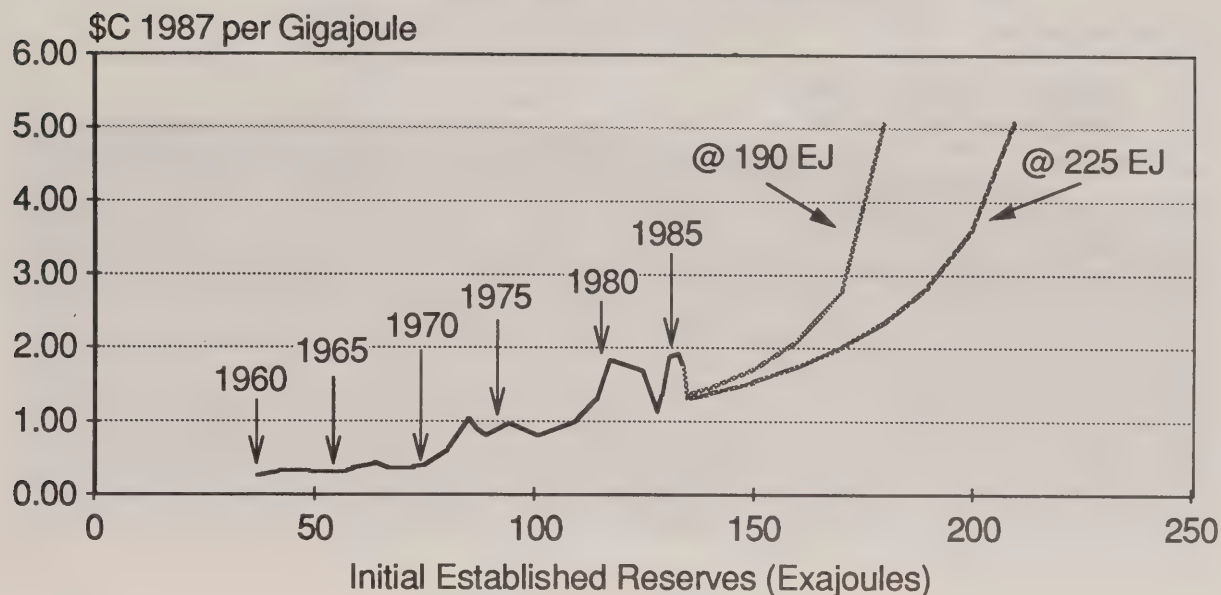


Figure S-2

Natural Gas Supply and Demand For Canada Average Expectation (225 EJ) For WCSB Resources With Exports Of 1.5 EJ Per Year

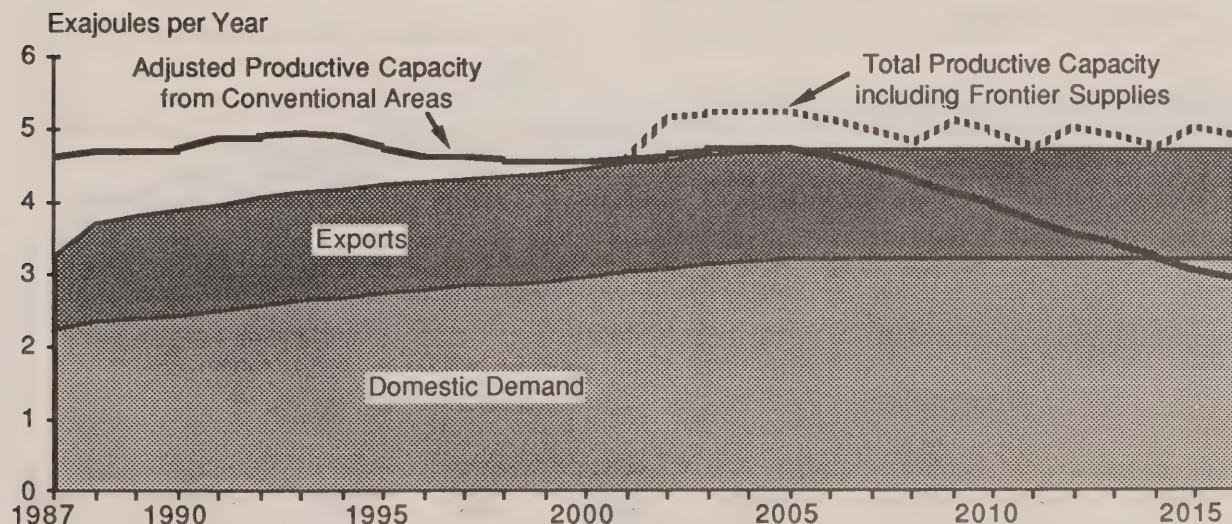


Figure S-3
Natural Gas Supply and Demand For Canada
Average Expectation (225 EJ) For WCSB
Resources With Exports Of 2.0 EJ Per Year

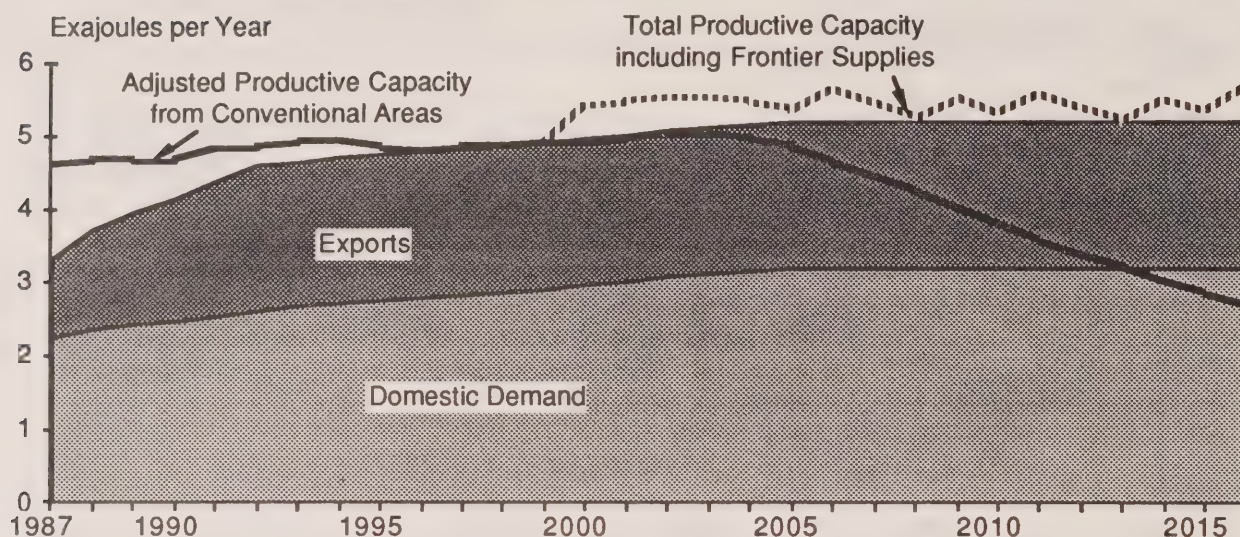


Figure S-4
Total Exploratory Drilling In WCSB
Average Expectation (225 EJ) For WCSB Resources

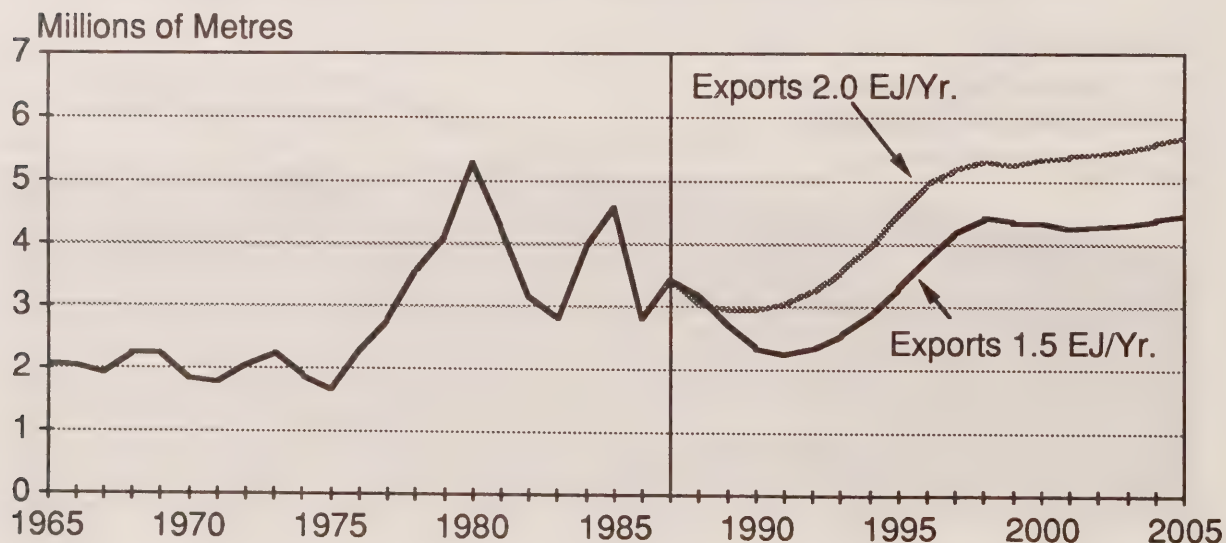


Figure S-5
Natural Gas Supply and Demand For Canada
Low Resources (190 EJ) For The WCSB
With Exports Of 1.5 EJ Per Year

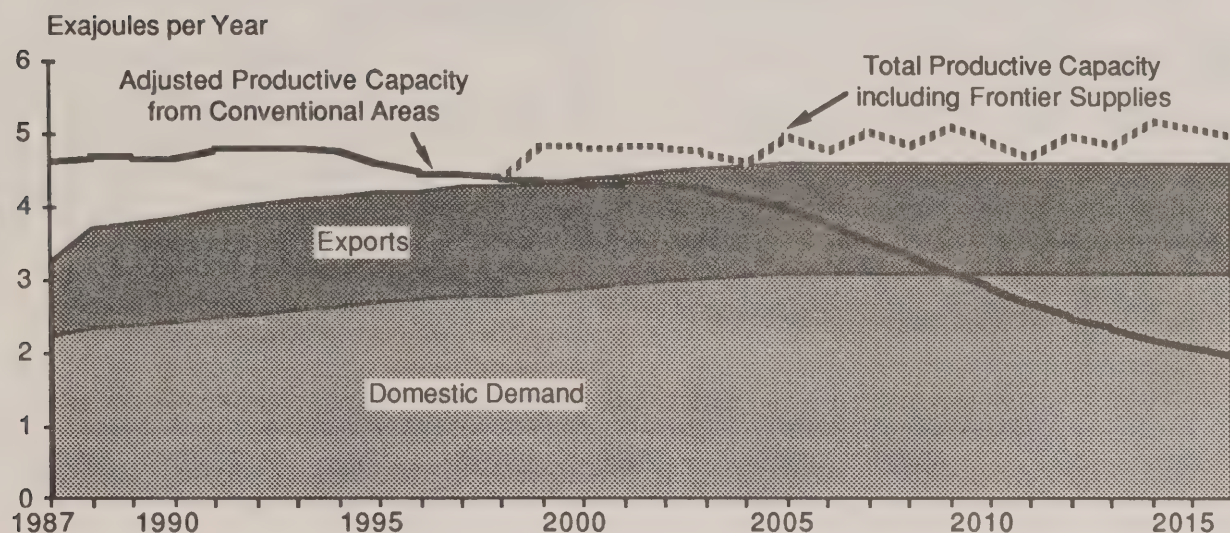


Figure S-6
Natural Gas Supply and Demand For Canada
Low Resources (190 EJ) For The WCSB
With Exports Of 2.0 EJ Per Year

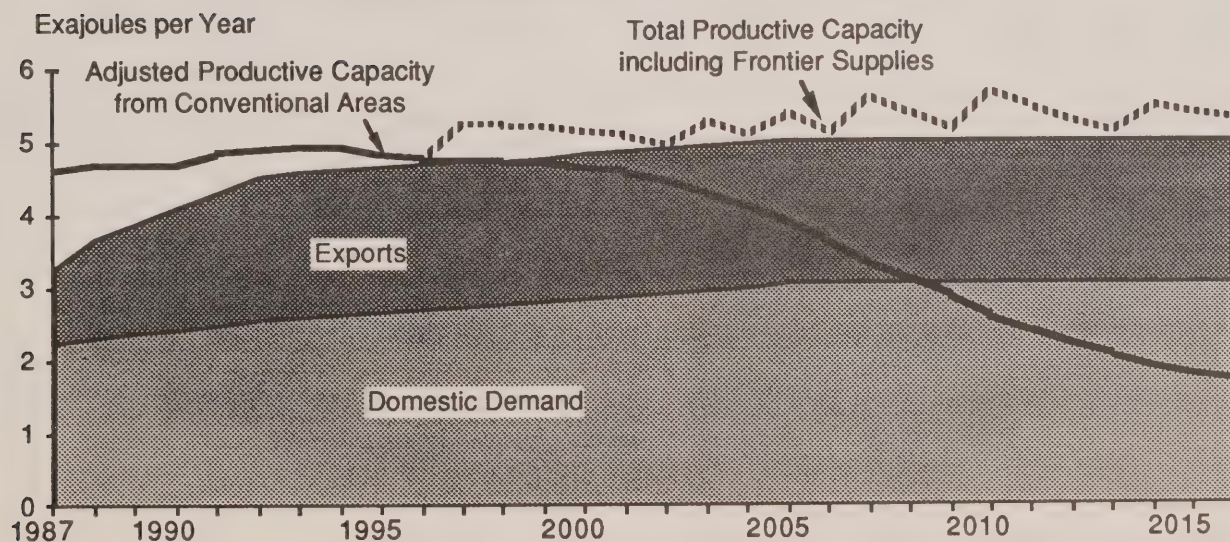
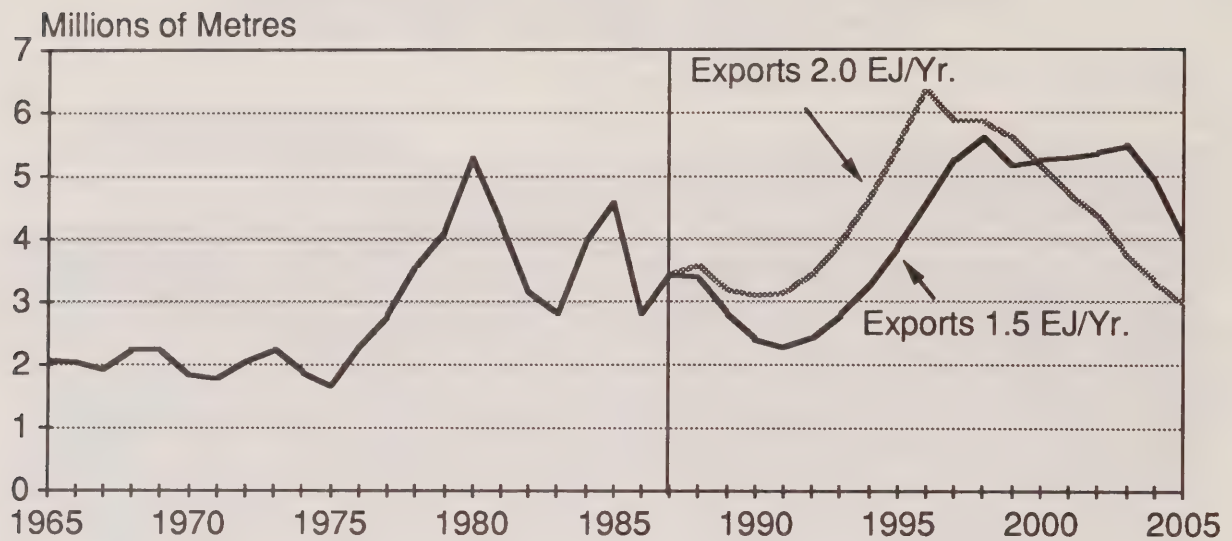


Figure S-7
**Total Exploratory Drilling In WCSB
Low Resources (190 EJ) For The WCSB**



Appendix 1 - Export Impact Assessment
Illustrative Analysis

Table 1 Price Impacts					
Average Resource Case					
		1987	1995	2000	2005
Ontario Residential					
Natural Gas (\$1987/GJ)	B	5.72	6.01	6.92	8.09
	I	5.72	6.79	7.53	9.26
Gas/Electricity (ratio)	B	0.65	0.67	0.77	0.90
	I	0.65	0.76	0.84	1.03
Gas/LFO (ratio)	B	0.69	0.81	0.90	1.00
	I	0.69	0.92	0.98	1.14
Quebec Residential					
Natural Gas (\$1987/GJ)	B	6.67	6.49	7.47	8.75
	I	6.67	7.34	8.15	10.03
Gas/Electricity (ratio)	B	0.83	0.80	0.92	1.08
	I	0.83	0.91	1.00	1.24
Gas/LFO (ratio)	B	0.90	0.99	1.09	1.20
	I	0.90	1.12	1.19	1.38
Low Resource Case					
Ontario Residential					
Natural Gas (\$1987/GJ)	B	5.72	6.60	7.68	9.06
	I	5.72	7.41	8.65	9.71
Gas/Electricity (ratio)	B	0.65	0.74	0.86	1.01
	I	0.65	0.83	0.96	1.08
Gas/LFO (ratio)	B	0.69	0.89	1.00	1.12
	I	0.69	1.00	1.12	1.20
Quebec Residential					
Natural Gas (\$1987/GJ)	B	6.67	7.13	8.30	9.81
	I	6.67	8.01	9.36	10.52
Gas/Electricity (ratio)	B	0.83	0.88	1.03	1.21
	I	0.83	0.99	1.16	1.30
Gas/LFO (ratio)	B	0.90	1.09	1.21	1.35
	I	0.90	1.23	1.37	1.45

B = Base case exports (1450 PJ)

I = Impact or high export case (2000 PJ)

Table 2
Energy Demand (Selected Fuels) PJ/ year

Average Resource Case					
		1987	1995	2000	2005
Ontario Residential					
Natural Gas	B	233	279	295	302
	I	233	262	276	274
Electricity	B	145	170	170	176
	I	145	168	170	175
LFO	B	57	39	36	31
	I	57	47	47	46
Total Demand	B	481	539	560	568
	I	481	530	551	554
Quebec Residential					
Natural Gas	B	29	37	37	37
	I	29	28	26	21
Electricity	B	161	203	219	231
	I	161	204	220	233
LFO	B	65	39	29	22
	I	65	46	37	33
Total Demand	B	305	337	345	351
	I	305	336	343	349
Low Resource Case					
Ontario Residential					
Natural Gas	B	233	267	275	276
	I	233	251	256	255
Electricity	B	145	169	172	175
	I	145	168	171	175
LFO	B	57	45	44	42
	I	57	53	55	55
Total Demand	B	481	532	548	551
	I	481	522	538	542
Quebec Residential					
Natural Gas	B	29	30	26	21
	I	29	22	15	9
Electricity	B	161	204	220	235
	I	161	204	221	236
LFO	B	65	44	37	30
	I	65	50	45	40
Total Demand	B	305	336	343	348
	I	305	335	342	347

Table 3
Energy Demand (Selected Fuels) PJ/ year

Average Resource Case					
		1987	1995	2000	2005
Ontario Commercial					
Natural Gas	B	166	203	215	228
	I	166	195	208	216
Electricity	B	129	145	150	160
	I	129	145	151	160
Oil Products	B	20	16	16	14
	I	20	19	19	18
Total* Demand	B	318	369	386	406
	I	318	364	382	398
Quebec Commercial					
Natural Gas	B	48	69	75	77
	I	48	66	71	72
Electricity	B	92	100	105	109
	I	92	101	105	109
Oil Products	B	26	25	24	22
	I	26	26	25	24
Total* Demand	B	169	199	208	213
	I	169	197	206	210
Low Resource Case					
Ontario Commercial					
Natural Gas	B	166	197	207	214
	I	166	190	199	205
Electricity	B	129	145	151	160
	I	129	145	151	160
Oil Products	B	20	18	19	18
	I	20	21	22	21
Total* Demand	B	318	365	381	396
	I	318	360	376	391
Quebec Commercial					
Natural Gas	B	48	67	71	71
	I	48	64	67	68
Electricity	B	92	101	106	109
	I	92	101	106	110
Oil Products	B	26	26	25	24
	I	26	27	27	26
Total* Demand	B	169	197	206	209
	I	169	196	204	207

* includes energy forms not tabled here

Table 4
Total End-Use* Energy Demand (Selected Fuels) PJ/ year

Average Resource Case					
		1987	1995	2000	2005
Ontario					
	B	1870	2193	2346	2480
	I	1870	2178	2332	2459
% Change		0	-0.7	-0.6	-0.9
Quebec					
	B	1130	1298	1363	1411
	I	1130	1294	1360	1407
% Change		0	-0.3	-0.2	-0.3
Canada					
	B	5321	6120	6525	6913
	I	5321	6075	6486	6852
% Change		0	-0.7	-0.6	-0.9
of which					
Natural Gas	B	1822	2199	2385	2563
	I	1822	2129	2309	2453
% Change		0	-3.2	-3.2	-4.3
Oil Products	B	1082	1110	1144	1157
	I	1082	1137	1179	1207
% Change		0	2.4	3.1	4.3
Low Resource Case					
Ontario					
	B	1870	2183	2329	2454
	I	1870	2168	2314	2440
% Change		0	-0.7	-0.6	-0.6
Quebec					
	B	1130	1295	1359	1405
	I	1130	1292	1356	1402
% Change		0	-0.3	-0.2	-0.2
Canada					
	B	5321	6089	6478	6838
	I	5321	6046	6436	6800
% Change		0	-0.7	-0.6	-0.5
of which					
Natural Gas	B	1822	2151	2310	2452
	I	1822	2086	2236	2375
% Change		0	-3.0	-3.2	-3.2
Oil Products	B	1082	1127	1170	1195
	I	1082	1153	1204	1234
% Change		0	2.3	2.8	3.2

* excludes the transportation sector

